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China Report

SCIENCE AND TECHNOLOGY

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CHINA REPORT

SCIENCE AND TECHNOLOGY

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ENVIRONMENTAL QUALITY

ABSTRACTS

CHEMISTRY

GEOLOGY

NEW TECHNOLOGICAL REVOLUTION PROVIDES CHALLENGE, OPPORTUNITY

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 7, 12 Jul 84 pp 23-24

[Article by Yang Yaozhong [2799 5069 0022]: "One Reformer's Ideological Sparks"]

[Text] I recently had the good fortune to attend an academic seminar in Hefei on "the new technological revolution and structural reform." Let me summarize below the main ideas raised at the seminar.

I. The New Technological Revolution, A Challenge and an Opportunity

The new technological revolution presents us with an opportunity as well as a challenge. A correct policy is the key to meeting this challenge while structural reform is a major prerequisite to our success in riding with tne "new tide." It is impossible to open up a new phase in economic revitalization without comprehensive reforms in economic organization, personnel, and structure, etc.

All the talk about meeting the world's new technological challenge has generated a sense of urgency about reform, even a sense of crisis. Previously, we appraised our economic development in terms of the past. As we face the new open integrated world economic system, we must internationalize our frame of reference. Our economy has been growing so slowly for so long that not only has it fallen behind developed countries but the gap between us and other developing countries is also widening ominously. Reform is the only way to catch up.

We must firmly carry through with any reforms which promote the construction of Chinese socialism and the nation's prosperity and development. "We allow failures in reform, but not the absence of reform."

II. The Aim of Reform is To Smash the Two "Big Rice Pots"

Responsibility system reforms in the nation's rural areas, reforms in the Shekou industrial zone and reforms at Haiyuan shirt factory--they all prove that the worst ailment afflicting our nation's economic system is the two "big rice pots." Enterprises have been living off the state's "big rice pot," while employees have been doing the same with regard to the enterprises' "big rice pot."

The Shekou industrial zone reforms came about because there was no other way. Investments in this area are financed by high-risk money borrowed in Hong Kong's international financial market carrying at least a 9 percent interest rate. If a project goes into operation a day earlier, the enterprise stands to make a large sum of money. One day's delay, on the other hand, would mean paying extra interest worth several tens of thousands of dollars. As a result, "time is money and efficiency is life."

Existing state-operated enterprises will come to life, and technological progress and economic revitalization will materialize if the state terminates its responsibility for them and stops allocating them funds, forcing them to obtain bank loans and compete in international and domestic markets.

Enterprises, for their part, should not continue their responsibility for employees. Instead, they should set reasonable quotas and enforce strict assessment in order to bring about in earnest the principle of "from each according to his ability, to each according to his work." Incompetent workers should be let go to make their own living in society, either by hawking, cart-pulling or as a casual worker, while good workers should have the right to be promoted. By smashing employees' "big rice pot," we also set free their initiatives and creativity.

III. Factory Directors' and Managers' Powers Should be Increased

Since the enterprise becomes an economic entity, its leadership in effect enters into a contract with the state. It is imperative that the factory director and manager be given increased powers and a system be established whereby the director (manager) be held responsible for the operation of the factory. The factory director should have the last word on all administrative and production questions. There should be a cabinet, including a deputy director nominated by the director and appointed by the higher authorities. Middle-level cadres will be appointed by the director. He will also be authorized to dismiss workers, recruit staff in society and raise the pay of good workers.

IV. Reforming the Scientific Research System

Economic revitalization depends on science and technology which must be geared towards the national economy. Scientific research reforms must go hand in hand with economic reforms. The key to reforming the scientific research system also lies in smashing the two big rice pots. How this is done varies in accordance with the different nature of scientific research. Developmental and applied research units can emulate the Zhuzhou electronic factory in Hunan by carrying out a paid contracting system externally (with responsible authorities above and other units below, among others) and a topic contracting system internally.

The scientific research system should also diversify to include research organizations run by individuals as well as state-run large-scale research institutions and other collective units. The state should foster the former by providing all kinds of favorable conditions. Apple Computer Inc in America was founded by two graduate students working in a garage. In a few years, it developed into a leading multi-national corporation with annual sales topping 1 billion U.S. dollars.

Locally operated research institutions have appeared in China, such as the China glider research institute, and Lin'an physical chemistry institute which recently manufactured its first airship. We should encourage scientific and technological workers to take their research attainments to society and strike out on their own.

V. Reform and the Development of Expertise

To meet the new technological revolution and develop new enterprises ultimately depends on expertise. Economy technology expertise education. What kind of experts do and will we need most now and in the near future? Scientists and managerial experts with an international vision, a global strategic perspective and an entrepreneurial mind. At present, we must encourage a host of scientific and technological personnel to learn from entrepreneurs and urge students to apply for admission into departments of management, economics and law.

VI. Impediments to Reform

1. Theoretical research remains very backward. "Without revolutionary theory, there would be no revolution." Since the theory of reform remains in a very preliminary stage compared with the practice of reform, reformers these days are hesitant, timid and fearful. The theoretical community must change the ivory-tower nature of research and draw correct conclusions from the blood, sweat and tears of actual reform.

2. Pernicious "leftist" influences have been a stubborn barrier to reform. The most common stricture hurled at reformers is: "You are flirting with capitalism." What, after all, are the criteria by which we judge the "four insistences?" Continuing the old "leftist" ideological line? Or taking reality as our point of departure in all our endeavors, in strict accordance with the pragmatism of the third plenary session of the Central Committee?

3. Chinese social inertia, formed over thousands of years, can be described as a "super status quo.": 1) the doctrine of the mean, drifting with the tide, a fear of prominence, opposition to other people gaining prominence. We have such maxims as: the first bird gets shot; the rafter that shows its head spoils first; fame portend trouble for men as fattening for pigs; a tall tree catches the wind, etc. 2) the backwardness and jealousy of small producers. When they see others doing well, some people become jealous and, instead of using all their ingenuity to beat their competitors, they wrack their brains

to do them in, even going so far as to fabricate rumors and slanders. The result is that nobody wants to do better than his neighbors. 4) The narrow-minded prejudices born of a closed system. Things foreign are either dismissed as heretic, evil and capitalistic, or worshipped blindly.

4. The instinctive resistance by vested interests. Because reforms strike at their vested interests, people who have long been living off socialism and others who are ignorant, incompetent and idle are bound to put up a stubborn resistance.

VII. Be a Sober-minded Reformer

People say that "all reformers in history came to grief." In China today, however, the leadership of the Central Committee of the Chinese Communist Party is the greatest reformer. As a result, we should be full of confidence and forge ahead with reform, while being careful to remain sober-minded at the same time.

The success or failure of reform may be a function of its opposition. But then it could also be a function of the reformers themselves. If we do not go about it scientifically, act with undue haste, are careless and cannot ferret out pseudo reformers, we might suffer setbacks and fail.

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NATIONAL DEVELOPMENTS

CONFRONTING CHALLENGES OF NEW TECHNICAL REVOLUTION

Wuhan HUBEI RIBAO in Chinese 26 Apr 84 p 4

[Article by Xia Xingyuan [1115 5281 0954]: "A Counter Opinion on Dealing With the New Technical Revolution."]

[Text] At present, there are developments daily in the world's science and technology, to the point where we are verging on a new technical revolution. It is estimated that within 20 years, developments in many new scientific and technical fields, particularly in microelectronics, will pass through stages of miniaturization, automation, computerization and roboticization, constituting a major breakthrough in society's production forces; this must have a great impact on the economy and on society. For China, this is both an opportunity and a challenge. This new technical revolution we are now facing is characterized by the rapid development of high technology and new industries, which use computers (miniaturized machines) to closely integrate the capabilities of computers with machine systems to process information. This can serve as a substitute for the physical labor of humans, and in part for their mental work, thereby greatly increasing the efficiency rate of labor, and greatly increasing society's production. The new technical revolution will of necessity take mankind through the transition from the industrial society to the "new society." Western scholars may phrase this differently, but no matter what they may call it, they all recognize that science and technology influence production, and they realize that the emergence in quantity of new technologies is bringing about socio-economic changes. Viewed from a Marxist standpoint, the new technical revolution includes not only enormous qualitative changes in the forces of production, it also includes qualitative changes in the relationship between society and production. What Western scholars call the industrial society is, in essence, a capitalist society; moreover, the future new society presaged by the new technical revolution must in essence bring the death of capitalism and the victory of communism.

As we face this new trend toward greater development of the world's current science and technology, what is my counter opinion? I know that at present it is important that we stress the proper handling of the following several relationships:

First, maintain an appropriate balance between the development of traditional industries and that of newly emerging industries. While newly emerging industries of course cannot be developed apart from the existing industrial base, still we can utilize the new scientific achievements of other, developed nations, in order to jump over some traditional stages of development, and thereby catch up with and surpass the world level of advancement. This is entirely possible. Because of this, while at the same time we are correctly handling our various traditional industries, we must vigorously take charge of developing our newly emerging industries. Running the existing, traditional industries well while developing the newly emerging ones is not contradictory, indeed it is actually complementary. On the one hand, running the existing traditional industries well, can lay a better foundation for the newly emerging industries, and promote their speed of development. At the same time, developing the newly emerging industries can better improve and reform traditional industries, and bring these traditional industries into fuller use.

Second, we must handle correctly the relationship between development of technology and knowledge intensive industries and development of labor intensive industries. Because under the conditions of science and technology advancement, knowledge as a production force has already become a critical factor in economic achievement. We must accelerate the development of newly emerging industries, and must exert ourselves to build industries which are technology and knowledge intensive. It is true that China's huge population has caused a great unemployment problem; therefore it is essential that we build some labor intensive industries. However, in the same way that technology and knowledge intensive industries are developed, so can labor intensive industries be developed. Although new technology can substitute for manual labor to a considerable degree in production, management and service departments, and to some extent for mental work, it is also a fact that many fields which are concerned with intellectual functions can absorb considerable numbers of unemployed, and can moreover give rise to many new fields of employment.

Third, we must handle correctly the relationship between the development of science and technology and the development of education. Because, along with the development of science and technology, it is essential that there be relatively high level scientists, engineers and managerial personnel, as well as relatively high quality workers. This is especially so since modern technology must be replaced very quickly; it is usual that there is a turnover every 5 or 6 years, and in the case of electronic computers as little as every 2 or 3 years. In order to deal with the new technical revolution, it is essential that there be a strong intellectual organization and a work force having a relatively high degree of scientific knowledge, suited to new changes. This requires that the whole of society put a high degree of emphasis on education. We must not only do well at the popularization of education

and at job training, we also must do a good job at higher education, linking it up with the scientific and technical development needs of society. At the same time, educational methods must be changed, starting from elementary and secondary school to foster an interest in science among our youth, and better stimulate their thinking and creative powers.

As Lenin pointed out, "The economist must always look forward, toward technological advancement; for if he does not, he will rapidly fall behind." ("Lenin's Complete Works," Vol 5, p 120). As we confront the new technical revolution, it is essential that all economic workers possess a strategic perspective, making carefully thought out, well-planned strategic decisions. With a foothold in the present, facing the future, we welcome the challenges of the new technical revolution.

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SCIENTIOLOGY, STRATEGY OF SCIENTIFIC RESEARCH DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 7, 12 Jul 84 pp 25-26

[Article by Ouyang Jiang [2962 7122 4829]: "Scientiology and the Strategy of Scientific Research"]

[Text]

I.

Scientific development and knowledge explosion have reached the point where we almost cannot grasp them by conventional methods. The boundaries between disciplines have become more and more finely defined with myriad inter-disciplinary interactions. People who are engaged in science often fail to see the forest for the trees and it has become increasingly difficult to come to grips with the essence of science. People like us who deal with science all the time also find it hard to take in the whole panorama of science. "We do not know what Lushan mountain really looks like because we are in the midst of the mountain itself."

But if we fail to grasp the essence of science or understand it as a whole, we cannot possible "sit within a command tent and devise strategies that will assure victory a thousand li away" in the development of scientific research planning.

It is that thought which gave rise to the topic: "Scientiology and the Strategy of Scientific Research."

II.

Scientiology differs from any other concrete subject in that it takes science itself as its object of study. Its aim is to grasp science in its entirety and in its essence. Scientiology itself is also a field of study.

Closely related as they are, science and technology differ from as well as resemble each other. Broadly defined, scientiology should also incorporate technological theories.

Specifically, scientiology consists of the history of science, the history of scientific thought, the essence of science, and methods of scientific study (including, of course, the history of technology, the history of technological thought, the essence of technology and the methods of studying technology). These three areas are organically integrated and it is exactly the idea of organic integration which is what scientiology is all about.

Why do we say that the three areas are integrated organically? First, because answers to questions concerning the "essence of science" and the "methods of scientific research" can be found only in history, the history of science, and the history of scientific thought. Second, without an adequate understanding of the "essence of science" and the "methods of scientific research," we cannot claim to be students of the history of science. This is because the former provide a frame of reference in the observation, collection and systematization of data. Third, without dlarifying "the essence of science," we are in no position to discuss the "method of scientific research." On the other hand, if we understand the "methods of scientific research," we would be better equipped to grasp the "essence of science."

Of the three areas, the history of science and the history of scientific thought are very important. Because what is now history must have been reality with its own raison d'etre at some point in the past. Only by understanding past currents and existing trends can we predice the future and make sure that we would not lose our way on the long and winding road of scientific development.

The only way to cure our tunnel-vision and short-sightedness is to explore science in the way discussed above and consider such an exploration a science in itself. It can thus be said that scientiology is a prerequisite for people engaged in scientific research planning.

III.

Right now there are no systematic studies on scientific research strategy. What we often do is to "zero in on one point and ignore the rest."

For example, computer technology can often work miracles. But we must not let this go to our heads. Computer technology differs from other technologies in that it more heavily relies on human thinking. The computer functions only when it is fed information. There is an "input" system here made up of a testing system, a management system and a mathematical model. The information that it produces. Without these supplementary conditions which make up a coherent system, even more advanced computer technology would be useless. The development of computer technology, therefore, must take them into account.

To cite another example, agricultural scientific research strategy must be even more suited to the entire agricultural development strategy. On no account could basic conditions be ignored. Given an area where

over 80 percent of the land is arid, for instance, it is obviously inappropriate to devote 80 percent of the resources to the study of corn varieties which need a great deal of water.

In mathematical research, too, there should be a correct strategy. It is a fact that the theory of numbers was once the focus of research in mathematical history. In the 1980's, however, it is not the best thing to spend an excessively amount of resources to solve problems in the theory of numbers, instead of putting them in branches with greater potentials, such as differential geometry, differential equation and abstract algebra.

This mass of facts demonstrates that not only is scientific research very crucial, but it must also be studied systematically.

IV.

Strategic issues are matters of overall importance. Scientific management occupies a sphere of its own, with its peculiar strategic problems. Note that the main object of strategic deployment in scientific and technological management are people who have mastered science and technology, not equipment or facilities. (Examples abound of money being wasted because we lack the appropriate experts to work with advanced imported technological facilities.) It is precisely for this reason that we cannot merely understand the history of science and its present stage. We must also know the scientific and technological standard of those of us who have mastered the subject.

In the case of a research institute, what are its strategic issues? Which of its conditions must we understand when we consider such issues? In general, they include the essence of the branch of science or technology in question; its present developmental state and trend, the developmental state of other sciences (or technologies) closely related to it; its relation with the national economy and with culture and education, and the concrete expression of the relation between basic theories and applied science, etc. Of course, it is even more important to identify the decisive move that the institute should take in its march ahead because, as Comrade Mao Zedong put it, what is important or significant depends on the actual circumstances.

A crack shot is not necessarily a strategist. With his own special training, a strategist must know the entire subject like the back of his hand, and be quick to spot any budding ideas. Instead of being bogged down in minor successes or failures, he shoul' always have his eye on the overall situation and foresee the developme.' of the science (or technology) concerned as well as the role his ins.itution can play in the development. The important thing is that he must have the ability to deploy forces to good effect, by using them where they can make a difference. Many opportunities for overall victory would be lost if he invests a lot of resources in areas that have no impact on the total situation while leaving a gap at a vital point.

V.

Sun Zi said, "Know the enemy and know yourself, and you can fight a hundred battles with no danger of defeat." He also advised us to "judge the hour and size up the situation." As a scientific research strategist, what must one do in order to achieve the above? First, he must master the essence of science and science in its totality and understand its past and current trends. That means that he must study scientiology (one must never hold rigid views about this discipline because its substance enriches as science develops.)

As a result, the study and investigation of scientiology is neither a soft job nor mere idle theorizing. It is a task of top priority for the leader who wants to have a good grip on the management of scientific research.

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ADJUSTMENT, REFORM OF SCIENTIFIC RESEARCH ORGANS URGED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 7, 12 Jul 84 pp 27-29

[Article by Xu Qianwei [6079 0467 0251]: "A Discussion of the Adjustment and Reform of Scientific Research Organs"]

[Text] In accordance with the demands of the State Scientific Commission concerning the adjustment and reform of scientific research organs, and supported by the Tianjin municipal CPC committee and the municipal government, the Tianjin municipal science and technology commission has directed all responsible bureaus and companies in the entire city to adjust all scientific research organs from 1983 onwards and to progressively introduce reforms on the basis of the adjustment effort. Through adjustment and reform, scientific research organs are taking on a new look and have improved their quality and increased their ability to serve economic construction.

I. The Need for Adjusting and Reforming Scientific Research Organs

The phenomenal development of modern science and technology, particularly the looming "new industrial revolution," demands that scientific research organs develop new technologies, grasp, digest and absorb advanced technologies suited to our nation, produce new ideas based on needs, and bring forth scientific achievements extensively, even for export overseas. They must further open up international technological cooperation and academic exchange, maintain the nation's technological reserve at a certain competitive level at all times and continuously train all kinds of scientific and technological workers of a fairly high standard.

Without prompt adjustment and reform, scientific research organs will not be able to function effectively and the new technological revolution will not be able to accomplish many tasks in time. After more than a year's adjustment and reform, scientific research organs in the Tianjin municipality are undergoind far-reaching changes and have obtained thirty major achievements. More than 40 new technological and research projects, including 13 of the nation's priority areas and key technological products, are slated for joint development by the municipality's scientific research organs and related factories and colleges.

Furthermore, the development of modern science and technology directly affects changes in the economic structure and renewal of the product mix as well as improvements in production conditions and the environment. Scientific research organs are the backbone for good scientific research. Through adjustment, reorganization, reform and upgrading, we must ensure that the forces of developmental research, applied research and basic research are well organized in order to serve economic construction and production development, either directly or indirectly.

The adjustment and reform of scientific research organs in Tianjin are aimed at resolving local industrial production problems, reorienting scientific research even more towards production realities, and energetically pushing ahead with the study, development and application of production technology. The idea is to serve not only immediate production needs, but also those of future technological development and product development, so as to come up with products with a local flavor which will be winners in international and domestic markets. In the past, for instance, the paper research institute did not get on well with the paper manufacturing enterprises. As a result of adjustment and reform, however, it has undertaken for them 19 research projects since last year and has helped them obtain very good economic results by applying 11 scientific research attainments. The enterprises have thus come to regard the work of the institute as practical, reliable and indispensable. The institute has recently been renamed by the leaders of the enterprises as the technological development center for the trade.

Specific shortcomings exist in our scientific research organs, eg. over-expansion, over-staffing, low efficiency and poor economic results. Both responsibility and authority are blurred, workers wrangle over trifles and "eat from the same big rice pot." How could this state of affairs meet the needs of socialist modernization and construction? Statistics show that only 28.2 percent of Tianjin's research institutions are fairly decent, about 50.4 percent are mediocre, while 21.4 percent are relatively poor. Consequently, adjusting and reforming our research organs demands immediate attention. We must solve the problem of some responsible departments passing for research institutions without really coming to grips with the basic issues.

Tianjin's scientific research organs have registered marked internal progress after adjustment and reform. According to statistics on 60 research institutions, their leading cadres have been improved in compliance with the demands of the "four transformations." Their average age has dropped from 53 to 49.3 years, and the proportion of leading cadres with a college education has risen from 49 to 60 percent. Many research institutions have taken on a new look; the housing research institute, the universal machine research institute, the industrial microbiology research institute, and the municipal engineering research institute, among others, have removed a large number of scientific and technological personnel and workers not suited to their needs and

recruited a host of experts with badly needed skills. The industrial automatic instrumentation research institute, the textile industry research institute and others have strengthened internal management and experimented with responsible systems and a flexible wage system.

II. The Adjustment and Reform of Scientific Research Organs Complement Each Other

The adjustment and reform of scientific research organs must be carried out in tandem. Tianjin's practical experience in this area proves that adjustment and reform are inseparable and complementary. Adjustment, which must be infused with the reforming spirit, paves the way for comprehensive reform. Reform, for its part, is the continuation of adjustment.

Some responsible bureaus and companies in the municipality started out by simply adjusting their scientific research organs and had very limited, slow results. Later, by zeroing in on reform, they soon achieved a breakthrough in both adjustment and reform. Seizing the moment when housing institute staff were being reshuffled, the housing management bureau transferred out those who did not belong in scientific research and subsequently helped the institute in reforming its personnel system. A stipulation was made that prevents people without the relevant professional or technological ranks from working in the research office, which successfully removed 16 incompetent workers. In adjusting scientific research organs, the municipal science and technology commission made usre that reform was never lost sight of. On the one hand, they came to grips with the basic construction of the organs through comprehensive adjustment. On the other hand, they used a number of experimental units as an impetus to reform. For example, the welding institute put into effect an external technological development contract system, while the knitting institute and the paper institute set up technological development centers on a trial basis. Furthermore, some research institutes have established a scientific research responsibility system. Irrespective of his position, everybody realized that adjustment had provided the groundwork for reform, while reform had added vitality and impetus to adjustment.

III. Strengthened Leadership is Indispensable to Adjustment and Reform

The adjustment and reform of scientific research organs is a comprehensive and difficult task which involves many policy matters and covers a large area. All responsible departments should pay close attention to this task and put it on their agendas. Plans should be drawn up and forces organized to ensure their actual fulfillment. Judging from Tianjin's practical experience, leadership in adjustment and reform can be strengthened along the following lines:

1. All relevant leading departments should act in unison to bring about adjustment and reform.

Both the Tianjin municipal CPC committee and the municipal government attach a good deal of importance to adjustment and reform. The former put forward a concrete demand for outstanding results at a working conference at the end of 1982. In March 1983, the municipal government formally approved documents evaluating the report by the municipal science and technology commission on adjustment and reform. It also instructed all responsible bureaus and companies to seriously come to grips with the task. Charged with its implementation, the municipal science and technology commission convened two working conferences on adjustment and reform in late 1982 and mid-1983 to discuss strategies and ways of expediting the work. All responsible bureaus and companies were instructed to deal with the problems realistically. Led by leading cadres in charge of science and technology and the chief engineer, an adjustment and reform task force was set up consisting of responsible cadres from such departments as personnel, science and technology, labor, wages and finance. Its mission was to ensure that adjustment, reform and check-and-accept work were properly carried out. The final examination is performed by the municipal science and technology commission. Those who pass are awarded a certificate while those who fail must reform within a certain time. Specific weaknesses must be dealt with, and nobody would be allowed just to go through the motion.

2. Adjustment and reform should begin with the leading cadres.

How should one go about adjusting and reforming scientific research organs? The Tianjin municipality began by adjusting and reforming the leading cadres, with excellent results. Improving leading cadres is the key to upgrading the quality of scientific research organs. By choosing the right leading cadres, we then can depend on them to carry out other adjustment and reform measures. Without capable leadership, not only will it be difficult to adjust and reform comprehensively and thoroughly, but it will also be impossible to lead the scientific and research contingent to serve economic construction. The original leading cadres at the dyeing institute were relatively old, their average age being 59.4 years, and were tardy in adjustment efforts. After reorganization, the new leading cadres are only 50 years old on average and are dynamic workers. The new director, Tao Zengkang [7118 1073 1660] is a 53-year-old senior engineer. Upon becoming director, he implemented further adjustment and reform in other areas, took new strides towards serving the trade and did much to change the products of several small and medium-sized factories.

3. Comprehensive reforms should be combined with emphasis on key points.

While the adjustment and reform of scientific research organs must be carried out across the board, we should also highlight the key points, mainly:

clarify the direction and tasks of scientific research organs. At present some scientific research organs do not have a clear sense of direction or assign tasks in a way not suited to the demands of coordinated development between science and technology, on one hand, and the economy and society, on the other. This situation prevents the organs from playing their part fully and must be changed.

1) In light of the nation's guiding principles for scientific and technological development and the demands of the local scientific and technological research system, and based on practical needs and possibilities, we should distinguish between research organs according to their different nature and determine their direction and tasks accordingly. Organs with ill-defined orientation and tasks should be adjusted, depending on the level of their equipment. When research organs duplicate others' tasks, or perform the same research as that assigned by the Central Committee to defense research units and institutions of high education, they must change their direction and tasks, provided they can make use of others' attainments.

2) Scientific research organs engaged in applied research and developmental research should emphasize the development and research of production technology, work out the relationship between long-term projects and immediate tasks, between the advancement of technology and its economic feasibility, between research on new products, new materials, new handicrafts and new equipment, and between the planning and assignment of tasks by higher authorities and the self-selection of projects.

3) Closely integrate scientific research with production in an appropriate way and devote major efforts to the establishment of technological development centers and complexes combining scientific research and production.

The scientific and technological contingent must be adjusted and reformed because without experts, there would be no scientific research attainments. Adjustment is necessary to improving the quality of the contingent.

1) In light of its original authorized size, we should appraise and determine the staffing level of a research organ, and decide the proportion of various kinds of personnel and their proper ratios in terms of age, specialties, knowledge and titles. The existing scientific and technological contingent, administrative personnel and workers should be reorganized. With the approval of the higher personnel and labor departments, people who do not belong in the research organ should be removed, while suitable measures should be taken to increase badly needed experts through external recruitment or internal retention.

2) The enthusiasm and creativity of scientific and research personnel should be fully mobilized through adjustment. The director of a research office and the head of a research topic group should be properly chosen. A topic group may be formed voluntarily by the people involved, with the approval of the leadership, or through joint consultation and decision by the leadership and the public. An assessment system should be set up for scientific and technological personnel, and the assessment results put in files as themain basis for award and promotion. Various means should be found to upgrade the training for existing scientific and technological personnel, particularly middle-aged and young workers forming the backbone of the research contingent.

3) The ideological and political work among scientific and technological personnel, cadres and workers should be strengthened, together with socialist spiritual education and legal and professional training. Measures should be taken that show a concern for the livelihood of the people and to improve logistics services.

4. Management must be reformed and a variety of responsibility systems set up.

To make management more scientific and systematic, we must reform all the managerial functions in scientific research organs and set up a variety of responsibility systems.

1) In accordance with the need to reorient scientific research towards the economy, we must adjust and strengthen the internal organizational mechanisms, making them simpler but better, improve managerial methods and raise efficiency, for instance, by trying out a paid contracting system.

2) Responsibility, authority and benefits should be unified by establishing a responsibility system for all kinds of work, which would guarantee the successful completion of every scheduled task.

3) Based on the principle of combining material with moral incentives, we must work out an improved system of rewards and punishment with the related departments.

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CHINA'S SCIENTIFIC, TECHNOLOGICAL COMMUNITIES EXAMINED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 7, 12 Jul 84 pp 6-9

[Article by Li Qingzhen [2621 1987 5271] and Hu Fuchen [5170 1318 3819]: "China's Scientific and Technological Communities and their Mobility"]

[Text] At present, the world is faced with a new wave of scientific and technological revolution. Increasingly, as the traditional mode of production is gradually replaced by new knowledge-intensive industries, science and technology has become a direct producer. In these new industries, the majority of workers deal with information and are not involved in commodity production so that knowledge has become a vital strategic resource. Hence, the need of society for a huge number of scientific and technological personnel. The best of plans and strategies cannot be carried out without enough experts. To catch up with the world technologically as soon as possible and increase the dissemination of knowledge throughout our vast land, we must multiply our efforts to promote the formation and growth of scientific and technological communities all over the country. As a service to China's scientific and technological development, this article attempts to raise certain questions and identify some principles by examining our scientific and technological communities.

I.

Because modern scientific research requires a good deal of equipment and facilities, an extensive amount of literature and data and the coordination of experts from various specialties, scientific and technological personnel always take the form of a community. Like living organisms, scientific and technological personnel are subject to locational limitations and are influenced by their environment. They also interact with neighboring entities. Therefore, we can feasibly make a socioeconomic analogy between the scientific and technological community and a community in the biological world. To study scientific and technological communities is to investigate the interactions among scientific and technological personnel, the conditions for community development, the cultivation of communities, the succession of experts, and the relations with various external "factors," in order to stimulate the flourishing of scientific and technological communities.

Today, as the modern information-based economy assumes more importance with each passing day, social competition gradually shifts to culture and education. In the future the factory and the research institute will merge into one entity. The university will occupy a prominent position in society. The entire scientific managerial system will need even more effective state control. These socio-economic development trends merit our attention. The country's scientific and technological communities should gradually adapt to the trend in industrial development. Modernization nowadays requires more than importing whatever is advanced. It must rely on China's own scientific and technological vigor and research. The "information society" demands that the scientific and technological community creates knowledge and wealth optimally. In appraising a scientific and technological community, we must find out whether or not it emphasizes economic results for factories and enterprises. More important still, we must look for vitality and examine its ability or otherwise to produce generation after generation of expertise and comeup with achievements.

Scientific and technological personnel are presently in demand in our factories, scientific research organizations and universities. To operate normally, a factory requires at least the rational coordination of experts from such areas as technology, equipment, produce quality testing, computer and systems management. Technological innovation and product improvement, on the other hand, call for the development of creativity in a scientific and technological community. A scientific research organization is just that kind of community devoted to the exploration of new scientific theories and the invention of new technologies. It must nurture academic leaders to be masters in their areas as well train succeeding generations of young experts. It needs creative people with a spirit of scientific inquiry as well as people adept at logical reasoning and rigorous scientific experimentation. The research institute should encourage them to complement, coordinate with and stimulate each other. In scientific activities, expertise and research topics must continuously be improved in accordance with inherent scientific laws and the actual needs of the nation. The university plays an important role in the transmission of knowledge. It is a pool of expertise where research and teaching could promote each other and where new integrated subjects and frontier disciplines can be brought into existence. In China, the quality of the managerial contingent also plays a crucial part. Whether or not a factory, a research organization or a university can flourish and become dynamic and productive is almost inextricably related to its personnel (including logistics personnel) management standard. In the present new conditions, it is even more imperative that we strategically readjust and plan the scientific and technological communities in the nation.

II.

Comrade Deng Xiaoping has pointed out perspicaciously, "Some of our past practices were influenced by feudalism, including personality cult, the patriarchal system, patriarchal behavior and even the cadre-for-life system. We are now trying to avoid that phenomenon and intend to start by reforming the systems." Like Comrade Deng Xiaoping in his incisive comment, we must analyze the state of the nation concretely, boldly, historically and realistically and come up with firm measures in order to really develop a number of modern scientific and technological communities in China.

Improvements are needed in both the distribution and composition of scientific and technological communities in China. For example, a majority of personnel are confined to a specific locality for an extended period. Like villages, factories and universities, scientific and technological communities suffer from a lack of mobility, a condition not suited to modernization. In certain communities, administrative managerial personnel are both divorced from vocational work and not moved around for a long time, which is conducive to mental ossification, conservatism and may lead to scholasticism and bureaucratism. The blocking of the channels of mobility at academic units produces even more serious consequences. It exaggerates the relative importance of geography and results in insulated communities isolated from one another. In this way, what distinguishes one community from another is geography, not research topics, which does not favor the development of distinctive schools of thought. Communities often fail to obtain in time scientific research information in the same field from home or abroad. When a new research topic emerges, everybody stampedes to join the band wagon, wasting a great deal of expertise and funds. Inferior work is repeated in some localities, even throughout the country.

At some communities, furthermore, there are such phenomena as "over-concentration" of experts, "inbreeding" and "all in the family," which increases the mutual inhibition between experts and saps the vitality of a community. As a result, there always remains the same number of experts and the same number of research topics over a long period of time. The middle-aged and the young people have no exceptional abilities and lack competitiveness. In short, a status quo has come into existence. There are other academic units do not even have a single decent expert. Unable either to attract talent from outside or eliminate dead wood from inside, such units cannot but resort to "eating from the same big rice pot." The size of our scientific contingent is very small compared to that in advanced nations. However, owing to irrational personnel distribution and the failure so far to seriously follow party policies to fully mobilize the initiatives of scientific and technological personnel and make full use of their talents, unemployment has become a problem in some areas where there is not enough work to go around the almost all units have a surplus of personnel. This is truly a waste of expertise.

Scientific and technological communities at universities and research organizations include some incompetent non-academic workers. The managerial staff of some academic units might have a college education but by cutting themselves off from teaching and research throughout the "ten tumultuous years," they have neglected their learning for a long time and are now academics only in name. Owing to the influence of unhealthy tendencies during the "cultural revolution," there also have appeared in some academic contingents incompetent people who "pass themselves off as experts," "quacks" and others who were admitted because they had the right connections. They are only good at holding back other experts and fomenting illegitimate ideas and practices. Any academic unit burdened with a large number of non-academics and incompetents is necessarily chaotic and unproductive. And herein lies the root cause of its inability to achieve practical results. To realize the great objective of the four modernizations, we have no choice but resolve to weed out the inefficient and unproductive.

China's existing wage systems and academic ranking and promotion systems are also imperfect in some ways. The rigid remuneration system which rewards all the sundry in all communities in accordance with some fixed ratios is no incentive to young and middle-aged experts to serve the state's key units. On the contrary, it promotes senility in a community, which is self-inhibiting. Taking advantage of the system's weaknesses, some people have managed to secure a high position and make a good living, thus setting a bad example in a community. Other people will be encouraged to concern themselves solely with the number of academic publications and ignore the development of science itself and the actual needs of social construction. Scientific personnel go preoccupied with the pursuit of a rank or position "through connections, seniority and abilities", in that order, to concentrate on scientific work are bound to become incompetent and worthless. As soon as they obtain a high position, they get complacent and lose all desire to improve themselves. All this demonstrates the need to further improve the wage and promotion systems to cultivate a sense of responsibility and dedication among scientific and technological personnel. Irrationalities in the composition of scientific and technological communities also directly reflect weaknesses in personnel systems. People in charge of personnel departments are only interested in controlling population growth in urban areas and reducing the difficulties of settling, and allocating housing for, the families of scientific workers. They emphasize planned allocation while ignoring the interchange of expertise. They only consider locals in allocating graduate students and transferring scientific and technological personnel in large city. As a result, key universities and scientific research units, many of them nation-wide communities to begin with, have become overladen with "natives," and suffered a decline in academic standard.

The failure of personnel work to uphold the principle of merit in hiring and its preoccupation with expediency have been harmful to the nation and the people and impeded scientific development. At this late hour,

some people still refuse to increase efficiency, pleading an abundance of labor. How can they fail to see that the absence of efficiency means high consumption, which in turn means a considerable waste of funds and expertise, leading to reduced economic results which may offset any gains in productivity? Facts prove that it just will not do to refuse to increase efficiency out of a fear of creating unemployment and readjusting social structure. To do so is tantamount to giving up the four modernizations and will only result in increasing possivity among us. There are so many tasks our country must do. The only problem is that we do not have enough experts. But if we fully mobilize the creativity, intelligence and talent of the entire nation, we could breathe life into socialist construction.

III.

To promote the modernization of China's scientific and technological communities, it is extremely important that we solve the problem of personnel immobility rationally. Only when personnel mobility exists can a community maintain its open nature, weed out its incompetents and prevent the development of corrupt ways. Personnel mobility speeds up the renewal of learning and facilitates the establishment of new disciplines, inter-disciplinary research and the solution of comprehensive technological issues. Personnel mobility also strengthens the self-regulating and self-organizing functions of a community and society, so that scientific research and knowledge transmission spontaneously adapt themselves to the development laws of science and social needs and that the many contradictions in the system and management can be exposed and remedied in time. Personnel mobility by itself can correct the irrationality now existant in community distribution and composition, strengthen inter-community competition, promote the formation of a variety of schools of thought and bring about a nation-wide situation in which a hundred flowers blossom, a hundred schools of thought contend.

Personnel mobility in itself creates a state where learning can flourish. After the third plenary session of the 11th Central Committee, the policy towards intellectuals has been further implemented. A large number of scientific personnel haveing rejoined their units, communities at all universities have been able to organize anew. Meanwhile, many new disciplines have appeared. We know that in Germany scientific research is centered at the university. In light of China's conditions, it would be more appropriate for us to gradually shift toward the university as a research center. In Germany, they have now made it possible for a university to recruit a researcher from another university as a form of expertise exchange. The United States, on the other hand, favors a contract system with young scientific researchers. The renewal of the contract and the renumeration of the researcher will depend on his achievements. To prevent the mental ossification of their personnel, institutions also limit the number of their teaching and research staff who are alumni of any one particular institution to a certain percentage of total staff. Among the 9,000 strong scientific and

technological workers at the famous Bell Laboratories, half are under 50. The mobility of experts is regarded as essential to keeping alive the dynamism of research. The fact is that the scientific and technological community is an open system. It needs extensive academic interchange and personnel mobility in a democratic atmosphere. Without personnel mobility, the vitality of the personnel community will be smothered.

IV.

Microcomputer, genetic engineering, optical waveguide fiber, laser, marine development and new materials and new energy resources--the applications of all these modern technologies are bound to cause a sharp new rise in social productive forces. Such forces face different prospects in capitalist and socialist countries. We can foresee that the new industrial revolution not only will fail to cure the problems inherent in the capitalist system, but will also accelerate the intensification of all its basic contradictions, ultimately creating the conditions for the world-wide victory of communism. Only the socialist system can open up a bright future for highly-developed productive forces. The new industrial revolution will also enable us to eradicate the feudal and capitalist evils left over from the old society and further improve our country's socialist system. To help our scientific and technological communities adapt to the new situation posed by rapid modernization, we put forward the following feasible ideas.

First, we must strengthen planning and management under the socialist system and promote the reform of the scientific and technological community system. From the strategic viewpoint and in accordance with China's circumstances, we should set up our own modern base for scientific research and our own modern industrialization area. Step by step, we should integrate teaching with research, forming scientific and technological centers that can both produce research attainments and serve as training grounds for experts in order that scientific activities will become a factor for the rational self-regulation of the social process. Scientific and technological activities should observe the development laws of science and technology, meet social needs, overcome the anarchism now existing in the selection of research topics andmake themselves an economically productive part of overall state policy. Scientific research organizations which cannot adopt to modernization, are detached from realities and have failed to achieve any results for a long time should be abolished. Research organizations that meet the needs of modernization, promosing new research areas and frontier disciplines must be fostered in order to keep the organic unity of teaching, research and social needs and to maintain the high efficiency of scientific activities.

We should replace incompetent people who are totally indifferent to the nation's future with a group of managerial experts, well-trained and dedicated to China's scientific and technological cause. The state

must retrain and redistribute scientific and technological workers, strengthen statistical work concerning the various targets for scientific personnel and solve some of the daily hardships of scientific personnel as soon as possible. In addition, to unclog the channels for the interchange of academic personnel across the nation, personnel systems must be reformed and perfected. Important academic communities must be guaranteed that a certain percentage of their middle and senior level personnel, particularly middle-aged and young workers, can move around freely and arrangements must be readily made to settle their families and provide housing for them. After the channels have been cleared, a natural equilibrium will be achieved over time. As soon as inward and outward mobility is realized nation-wide, not only will urban population explosion be curbed, but the excess population can also be diverted outwards. In this way, remote areas will be encouraged to adopt appropriate measures to attract the experts they need. At the same time, places which are naturally well-endowed may become cultural towns. Freed from the worry that they might not be able to move to a large city, scientific workers will settle down to productive work in small cities. While some people go to coastal cities, others may head for the interior and border areas in accordance with their qualifications and research needs. Mobility should be combined with a continuous effort to rectify the academic climate: both substandard communities and incompetent personnel should be eliminated to force them to reform and improve themselves. The efficiency of a scientific and technological community hinges on the caliber of its personnel. Only through the law of natural elimination via personnel mobility can we produce a group of communities which are superior and efficient. Only talented intellectuals obtain the confidence of the majority of people and upgrade the scientific achievement of the entire nation.

Key universities and research units must take steps to prevent the aging of their communities along with a decline in creativity. In general, at least 40 percent of the personnel at key national communities should be from outside the province or graduates from other institutions. The mobility target should be set at about 30 percent in order to facilitate personnel interchange. Research organizations should continuously reshuffle their personnel, allowing them to move from coordination sections to research departments and vice versa, even letting them change their research areas to stimulate their creativity. According to the studies of Yamada, a Japanese scholar, and others, every scientific and technological field of research in the world has its own rise and fall. When a particular field has passed its heyday, scholars should promptly move to other territory. When we see the gap in a certain field between China and other countries and try desperately to catch up, it might be better for us to devote our energies to break new ground in a new area. To encourage scientific and technological inventions and academic research attainments, we need to set up a rational system for academic evaluation and appraisal to replace the present amount of appraisal currently being carried out under various awards at an array of academic organizations. Appropriate publications should

also be put out to espouse different schools of thought. Academic evaluation organizations should uphold impartiality, discover talent, support innovation, and expeditiously report on the academic standards and research progress of scientific and technological communities and individuals, thus serving as an important means for implementing the party's policies and principles. When objective objective academic standards are established, we must gradually apply the socialist principle of distribution -- "from each according to his ability, to each according to his work" -- in order to make academic standards and work contribution the main criteria in determining a worker's pay. This move will benefit middle-aged and young scientific workers who are truly learned and who want to devote all their energies to the cause of science and technology.

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NEED FOR NEW COPYRIGHT LAW EXPLAINED

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[Article by Li Jingren [2621 2417 0086]: "A New Copyright Law Should be Formulated"]

[Text] The "Copyright Law of the People's Republic of China" was published recently, to take effect on 1 April 1985. Up till now, of the various legislative work dealing with intellectual output, such as copyright, patents, trademarks, etc., only copyright remains to be dealt with. In order to more efficiently safeguard and increase the rights and interests of our scientific and cultural authors, to encourage authors' creative enthusiasm, to advance the progressive development of China's arts and sciences, increase cultural and scientific exchange with foreign countries, speed up the construction of China's four modernizations, then the formulation of the new copyright law and the establishment of an organization to administer copyrights should be high on our agenda.

Since Liberation, concerned departments have issued various rules, regulations and procedures which deal with copyright, and these have had an important effect in encouraging scientific and cultural workers' creative activities. However, because till now a copyright law has not been formulated and promulgated, nor has there been a copyright administration organization established, therefore matters related to copyright both domestically and foreign have been relatively confused. Many problems, such as protections on copyright scope, time limits, copyright transfer and continuation, penalties for copyright infringement, etc., still lack specific, clear-cut regulations. This sort of situation not only does not aid culture and science to flourish and develop, it is also very inappropriate for what is required in opening up cultural and scientific exchange with foreign nations.

The problem of copyright protection is not only concerned with the prosperity and development of a nation's culture and science, it is also concerned with international cultural exchange, and is an important problem in the advancement of an entire people's cultural development. At the present time, there are more than 140 nations in the world which

have promulgated copyright laws and established systems for the protection of copyright. These include both socialist and capitalist nations, both developed and developing nations. The nations of the world have always helped supply one another's needs; there has never been a nation which could cut itself off completely from the world. At present, there are 129 nations with which China has established diplomatic relations. Along with the continual increase in China's cultural exchanges with foreign nations, China's publishing circles have had increasingly frequent contacts with publishing circles in other countries. Many countries have already proposed to China that there is a need for joint publication or bilateral copyright relations. In some of the cultural or trade agreements that our government has concluded with foreign nations, there are provisions for mutual protection of copyright. For example, on 8 July 1979, our government concluded a cultural agreement with the government of the Republic of the Philippines; Article Four of that agreement stipulates that, "The signatories agree that in accordance with the principle of reciprocity and each nation's laws and regulations, they will adopt the measures necessary to protect within their own territories the literary and artistic property rights of each other, including each nation's cultural earnings." In the same year, China concluded a trade relations agreement with the United States which carried similar provisions. This stated clearly that China will in the future assume an obligation to protect these nations' copyright in our laws and regulations.

In recent years there has been a loud cry for the formulation of a copyright law from our literary and artistic community and concerned departments. At both the Third Plenary Session of the Fifth National Peoples Congress and the First Plenary Session of the Sixth National Peoples Congress there were delegates who proposed that a copyright law was needed as soon as possible. Central leading comrades have also written an important memorandum, "Start as soon as possible to organize a group to draft a copyright law." The former State Publications Bureau set up a copyright research organization which made a serious effort to summarize China's experiences and study their foundations in foreign experience. This organization carried out a large-scale survey of research and assembled a wide-ranging quantity of materials dealing with Chinese and foreign copyright legislation. They also invited foreign experts to come to China to lecture, and assist in training copyright administrative personnel. With all this, it is clear that there is already sufficient preparation in rationale, theory, organization and materials, for the formulation of a copyright law and the establishment of a copyright administrative organization. All that remains is for concerned departments to create the conditions required for formulating a socialist copyright law that is characteristically Chinese; the birth of the new copyright law is just around the corner.

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TIANJIN'S INDUSTRIES BENEFIT FROM MILITARY TECHNOLOGY

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[Article by Xie Tzutong [0673 1311 1749]: "Lesson from Economic and Technological Cooperation between the State Defense Scientific, Technological and Industrial Commission and Tianjin Municipality"]

[Text] After an extended period of construction, defense scientific and technological industries have become a galaxy of talent with relatively substantial technical abilities and advanced technologies and equipment. Furthermore, they have invented and possess certain new technologies in the manufacture of both strategic and conventional weapons, in addition to a significant number of mature scientific attainments. How can we fully tap the technical advantage and production potentials of defense scientific and technological industries to speed up key projects and the technical transformation of the national economy, accelerate technical progress and quicken the four modernizations? This is a very significant economic question. The preliminary experience of the State Defense Scientific, Technological and Industrial Commission and the Tianjin municipality in economic and technological cooperation has answered our question in a powerful and vivid way, giving us many positive inspirations.

I.

Many of our industries and enterprises are wasteful, produce outdated products, suffer from low economic results and fail to make full use of their potentials. The direct causes for this situation are the small number of technological personnel, low technical standard, backward management and irrational systems. As one of China's major industrial cities, Tianjin on the whole has a fairly solid technological base and decent equipment, but weak links remain. We must come to grips with such top priorities as technological advance and transfer, particularly if we want to achieve the strategic objectives put forward at the 12th National Party Congress. The Tianjin municipal CPC committee and the municipal government have explicitly put forward a guiding ideology in economic work: "build up a base, improve standard, emphasize results, strive for speediness" and "adopt" all foreign and domestic advanced technologies and achievements. Through practical adjustment, defense

scientific and technological industries have earnestly implemented the principles of the Central Committee regarding "the integration of the military with the people, the integration of civilians with war, the priority of armaments and the support of the military by the civilians." Under the premise that priority should be given to themanufacture, testing and production of military weapons and equipment, these industries have revised their product mix, expanded services, and gone all out to develop products for civilian use and actively transferred military technologies to civilian purposes. As their ideological understanding matured, they have come to consider themselves duty-bound to make use of their technical superiority and production potentials to benefit the national economic construction even while they serve the modernization of national defense.

Led by leading cadres from the State Defense Scientific, Technological and Industrial Commission, and the defense Scientific and technological industries, groups of technical cadres twice visited Tianjin. They exchanged ideas with leading municipal cadres and held substantial talks with relevant industrial bureaus and companies. The Tianjin municipality also sent a delegation to Beijing to discuss with the State Defense Scientific, Technological and Industrial Commission and various departments in the defense industries. After hard work on both sides, the State Defense Scientific, Technological and Industrial Commission and the municipality of Tianjin formally signed an economic and technical cooperation agreement in late March 1984, setting up 296 cooperation projects. Within 1 month, more than 240 technical workers from various defense scientific and technological industries were sent to Tianjin in 36 teams to cooperate directly with the companies and enterprises to carry out the projects. Thus the implementation of the agreement was underway. Some projects soon produced obvious results. For instance, Tianjin's No. 2 Offset Printing Factory imported from Japan in 1964 a vertical. After being in operation for only 3 years, it went out of service because of a breakdown in the mainframe computer. At the request of the printing factory, a research institute under the Ministry of Space Flight Industry despatched five experts there, who took merely 15 days to restore the productive capacity of the equipment. Two research institutes in the Ministry of Nuclear Industry applied isotopic electro-isostatic elimination technologies to 15 gill boxes at the Tianjin's No. 1 Woolen Textile Mill. As a result, not only was labor intensiveness reduced, but productivity and product quality were also improved. The drop in electrostatic breakdowns also saves a large amount of raw materials and energy. Assuming the boxes will remain serviceable for 4 years, each will reduce losses by 6,300 kilograms and save 61,560 kwh of electricity. With the help of a research institute in the Ministry of Nuclear Industry, the Tianjin Citric Acid Factory applied extraction technologies to extract citrate from fermenting fluid, thereby raising the recovery rate from 80 to 90 percent. Under the existing production capacity, production cost per ton can be lowered by 500 yuan, saving 1.2 tons of sulphuric acid. We can foresee that as more projects in the agreement are implemented, much progress will be

made by Tianjin to promote economic and technological development, improve economic results and accumulate funds for the state. The defense scientific and technological industries, for their part, will have taken a major step ahead in transferring military technology to civilian use and in opening up a new phase in military-people integration.

II.

There are several notable points about the practical way in which economic and technical cooperation between the State Defense Scientific, Technological and Industrial Commission and the Tianjin municipality has been carried out.

1. The leadership took pains to transform the correct principles of the Central Committee of the CCP into the guiding ideology for both sides. The first secretary of the Tianjin municipal party committee, Comrade Chen Weida [7115 0251 6671], personally convened a meeting for leading cadres from various industrial bureaus, companies and key enterprises. He expressly pointed out that the demand for funds, energy and raw materials far exceeds supply even while we go all out to quadruple the total agricultural and industrial output value by the end of the century. The solution lies in technological progress. He reiterated the importance of economic and technical cooperation with defense scientific and technological industries for changing Tianjin's technical backwardness. Leading cadres from the State Defense Scientific, Technological and Industrial Commission also drew up a concrete plan for the various ministries in defense industries, stressing that the transfer of military technology to civilian use is an important means of realizing the integration between the military and the people. It also demanded that its enterprises and research institutes take the initiative to visit Tianjin to introduce their technical specialties and available equipment. By promoting mutual understanding, this move could also mobilize enthusiasm for economic and technical cooperation. To strengthen this project's organized leadership, a coordination committee has been formed by the State Defense Scientific, Technological and Industrial Commission, the Ministry of Nuclear Industry, the Ministry of Space Flight Industry, the Ministry of Arms Industry, the Ministry of Aeronautic Industry and the municipal government of Tianjin. The committee is responsible for coordinated planning and will monitor and coordinate implementation in a timely way and solve major coordination problems.

2. Zero in on urgent problems and emphasize economic results. Economic and technical cooperation between the Commission and the municipality is forged in the spirit of "one thing at a time." Projects are handled in turn in order of importance and urgency. At present, the emphasis is on 83 projects and 12 development centers, of which 34 projects are scheduled to be completed by the end of this year. The completion of these projects will bring about relatively significant social and economic results within a short time. Upon the completion of five projects involving corrugated paper, color television, transformers,

refrigerator compressors and high-speed steel fluted twist drill vacuum heat treatment and their going into operation in 1985, Tianjin will have achieved international standards of the 1970's in television broadcasting, domestic appliances, packaging and the machine industry. It is estimated that this will translate into a total industrial output of 160 million yuan, turning in a profit of 19 million yuan.

3. Integrate economic and technological cooperation with the introduction of technology from abroad and its transformation. Whatever the defense scientific and technological industries can supply, whether it be equipment or an integrated production line, should no longer be acquired from abroad, provided studies and demonstrations show that the domestic products are technically and economically feasible. For example, the production line for corrugated paper had already been included as an item to be purchased from abroad by the municipality. But a certain enterprise in the Ministry of Space Flight Industry already successfully manufactured and put into operation such a production line. After conducting on-the-spot studies and analysis, the municipality cancelled the importation plan and signed a contract with the Ministry of Space Flight Industry. As originally planned, this item included seven production lines and two sets of equipment, all to be imported. The revised plan called for the defense scientific and technological industrial ministries to design and manufacture the whole set, emulate foreign models creatively, or purchase in part. Furthermore, defense scientific and technological industrial ministries have been asked to take over 13 items originally included in the Tianjin plan for technological transformation. In this way, not only has the municipality economized on foreign exchange and investments and reduced the amount of imported raw materials, but it has also facilitated the development of civilian and military technology.

4. The principles, substance and methods of cooperation should be regularized by an agreement. The principles governing economic and technological cooperation between the State Defense Scientific and Technological ~~I~~ndustrial Commission and Tianjin are "long-term cooperation, practical results, mutual benefits, mutual improvements." Substantively, cooperation covers six areas: 1) the transfer and joint development of technological results involving new processes, new technologies, new materials and new products; 2) the design and manufacture of items for technological transformation; 3) joint venture and joint production; 4) mounting a joint attack on technology and technical cooperation; 5) technical consultation and services; 6) training technical cadres and technical workers. Contracts are signed with basic units directly, spelling out demands and responsibilities. Cooperation projects are basically funded with low-interest loans. Projects for technological transformation, technology importation and technological attack which were originally included in the Tianjin plan are financed by funds from the regular channels. Projects which promise relatively significant economic results and are capable of recovering their costs are invariably financed by loans. Others which might have considerable social significance but uncertain economic results are subsidized in part by local revolving funds.

III.

The well-planned, comprehensive, systematic and long-term economic and technological cooperation between the State Defense Scientific, Technological and Industrial Commission and the municipality of Tianjin is unprecedented in the nation. From the outset, it enjoyed the attention and encouragement from leading cadres on the Central Committee and the State Council. This event has some important lessons for us.

First, we must further raise our understanding of the transfer of military technology to civilian use. Such a transfer has considerable strategic implications for strengthening the defense scientific and technological industries and promoting the national economy. National defense industries directly serve a war purpose. They must possess an appropriately advanced technical capability corresponding to modern science and technology and maintain a large production capacity. This capability and capacity are dynamic and evolving. More important, they must be manifested in the advancement of technology and the improvement of standards. The objective existence of the contradiction between supply and demand during both peace time and war makes it necessary for the defense industries to make full use of its technical ability and speed up its transfer and popularization to various sectors of the national economy, apart from fulfilling its duties to manufacture and produce armaments. Furthermore, they must rationally exploit their production potentials and do their best to organize the production of civilian products as a contribution to the development of the national economy. Only thus could the technical capability and production capacity of the national defense industries be continually tested, sharpened and improved as we transfer military know-how to civilian use and organically integrate the manufacture and production of armaments with that of articles for civilian use. The technical capability and production capacity of the defense industries are precious assets in the construction of the national economy. Their planned and organized application to the civilian sector constitutes a key method of promoting technical progress and economic revitalization. The national defense industries must be considered a vital force to be used in key constructions in the national economy, technolotical transformation, the manufacture and importation of major pieces of equipment and in economic development everywhere. In the interest of comprehensive planning, the two forces of machine industry and the defense industries should be merged so that the transfer of military technology to civilian use can be combined with the importation of technology and the effort to mount a technological breakthrough. In short, the transfer of military technology should concern oot only the defense industries but also the various departments involved with the national economy and all localities. The key question now is for leading cadres and the rank-and-file technical workers and personnel in all departments, at all levels, and in all areas to understand this point, cooperate and have the courage to innovate at work, thereby doing their share to open up a new phase in military-civilian integration.

Next, we must speed up the reform of the industrial economic system and make our industries and enterprises vital economic entitles. This is a key to the success of economic and technological cooperation. The practice of "eating from the same big rice pot" destroys individual initiative and gives rise to a conservative, muddling-through mentality among workers who could not care less about economic cooperation or technological advancement, or anything else, for that matter. As long as this situation remains unchanged, economic and technological cooperation between departments, and between departments and regions, as well as the technological transformation of industries and enterprises will lack internal vitality and languish. If this situation is reversed, however, a completely different scenario will obtain. For instance, after the joint production paid contracting system came into effect in agriculture, the masses of peasants, formerly apathetic towards science and technology, are now very keen about it. Indifference has been replaced by an urgent demand and technical workers are regarded as living "gods of furtune." Tianjin's No. 13 Automatic Meter Plant is a small collective plant with only 370 people. To correct the passive situation created by poor sales and a high inventory in pressure reducers, it attached a good deal of importance to and took part in economic and technological cooperation. It invited eight engineers from a research institute under the Ministry of Space Flight Industry to assist in its technological transformation. The upshot was that the lifespan of its pressure reducer was lengthened from 10,000 times to 15,000 times. Sales improved considerably. It plans to produce 60,000 decompressors this year but already orders have been received for 78,000. The estimated output value for 1984 is 2.84 million yuan, with a profit of 620,000 yjan. Clearly, only by quickening the pace of reform and smashing the big rice pot could we remove the breeding grounds for such ideas as conservatism and contempt for knowledge and intellectuals. Only thus could we help enterprises develop a concern and desire for technical progress as a matter of individual economic interest and increase people's sense of urgency about economic and technological cooperation. The ultimate result is to better apply and popularize military technology and transform it into a productive force as soon as possible.

Third, we must promote mutual understanding between defense industrial ministries, on the one hand, and their civilian counterparts and localities, on the other. For a long time, defense industrial ministries have been in a state of seclusion and have had little contacts with civilian industrial ministries. The civilian departments do not know what their military counterparts can do for them or what the latter could offer in terms of technology. The defense industrial ministries, for their part, have no idea regardint the needs and requirements of the civilian ministries. This mutual ignorance is an impediment to the development of economic and technological cooperation. Recently a working conference was jointly held by the State Planning Commission, the State Economic Planning and the State Defense Scientific, Technological and Industrial Commission to discuss the development of civilian products through military-civilian integration. This conference brought

together comrades from the state defense industrial ministries, civilian industrial ministries, planning departments and integrated economic management departments to study and revise production and development plans for civilian products and science and technology. The conference also discussed measures to open up economic and technological cooperation. Having benefited from the conference, the participating comrades by and large felt that bilateral communication is a major prerequisite to doing a good job in economic and technological cooperation. The national defense industrial ministries should welcome comrades from all localities and from civilian industrial ministries to visit them and inspect their equipment and technologies. In this way, they obtain an understanding of scientific and technological achievements and technological reserve. Such visits also offer opportunities to discuss cooperation projects. Moreover, the military industrial ministries should take the initiative to conduct studies at civilian industrial ministries and enterprises and draw up a detailed list of items that can be transferred and popularized, and take up cooperation responsibilities. Mutual understanding can also be achieved through the establishment of technical consultation service centers, technical exhibits, technical exchange fairs and the publication of scientific and technical achievements and data, etc.

Fourth, leadership must be effectively strengthened. To promote economic and technological cooperation between national defense industrial ministries, on the one hand, and the localities and civilian industrial ministries, on the other, all localities and responsible departments must take a broad and long-term view, act as a "match-maker" and establish specialized agencies to organize and coordinate such cooperation. The aim is to adapt military technology more effectively to civilian uses. Moreover, problems relating to cooperation costs, renumeration, technology transfer with compensation, and achievements ownership should be solved in accordance with the principle of mutual benefit. In pushing ahead with economic and technological cooperation, we must be enthusiastic and ready to take the initiative. We must also have a scientific attitude and insist on the integration of necessity and feasibility. By proceeding from the simple to the complex, we can build up our confidence by first tackling those projects which produce effects quickly and then move on to the joint production of new products and the joint attack on technology.

At present China is drawing up a series of policies and regulations to promote technological progress and encourage economic and technological cooperation. As the domestic technical market becomes more developed and vibrant, objective conditions also get more favorable. A broad vista is emerging in the transfer of military technology to civilian use. The happy day will soon come when the defense industrial ministries will be cooperating extensively in economic and technical matters with all localities and departments. Let's grasp this good opportunity and speed up the pace of the nation's economic and technological progress.

12581
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SCIENTIFIC EDUCATION TO SERVE ECONOMIC CONSTRUCTION

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 7, 12 Jul 84 pp 20-22

[Interview with Qian Lingxi [6929 0109 1585], president of Dalian Engineering College, by Wang Xukun [3769 4958 3824] and Liu Zeyuan [0491 0463 3220]: "Scientific Education Must be Geared Towards Economic Construction"]

[Text] Professor Qian Lingxi attended Brussels University, Belgium, in his early years. Before liberation, he taught at Zhejiang University and was an engineer with the Department of Railroads. In 1952, he came to Dalian Engineering College and was successively head of the Departments of Civil Engineering and Mathematical Mechanics and director of the research institute in engineering mechanics. He was appointed president of Dalian Engineering College in 1981. He was a delegate to the Third, Fourth, Fifth and Sixth National People's Congresses, in addition to being a member of the China's Academy of Sciences and a director of the China Mechanics Society.

We visited the Engineering Mechanics Research Institute, Dalian Engineering College, at mid-summer to interview Porfessor Qian Lingxi, China's famous expert in engineering mechanics.

Taking time off from his busy schedule, Professor Qian Lingxi received us warmly and expressed his opinions regarding the way colleges of science and engineering should approach economic construction and the management and reform of teaching and education.

Our New Task is to Change Scientific and Technological Communities

Professor Qian Lingxi pulled out a set of materials from a pile of documents pouches on his desk and said as he turned the pages, "Some foreigners classify all the nations in the world into four types: post-industrial nations, nations in the second stage of industrialization, nations in the first stage of industrialization, and pre-industrial nations. Under this classification scheme, China belongs to the third group, that is, nations in the first stage of industrialization. The materials here suggest that in those nations, there is a vast gap between

the best-qualified top-notch scientists and the semi-illiterate masses. To fill this gap, we need middleOlevel administrative experts and technicians. If the middle structure is weak, modern science cannot penetrate through the entire social structure. This theory has much to recommend itself."

Professor Qian Lingxi said, "As I see it, scientific and technological communities in China as a whole can be divided into three levels, depending on the nature of their work. At the first level, we find first-rate world-class theoretical scientists. They are mainly engaged in basic theoretical research, exploring the laws governing the different areas in nature to provide a long-term scientific reserve for technological development. At the second level are senior scientific and technological personnel, including senior managerial personnel. Their main concerns are applied research, technological development and management. At the third level are middle and junior scientific and technical workers.

"Undoubtedly China is short of first-class scientists of international standard and outstanding scientists who are of Nobel laureate caliber. However, since our country at present has relatively limited economic resources, we cannot devote a large amount of funds to basic research. A number of years ago, a majority of students studying abroad majored in basic subjects like theoretical physics, and relatively few went in for technical sciences. This was not a rational situation. To revitalize the economy, apply advanced science and technology to strengthen the various sectors of the national economy and import advanced science and technology from abroad, we must urgently and extensively train scientific and technological experts of the second and third levels. To borrow an economic term, this means that we must emphasize in particular the training of "short-line technological experts" and make it a focal point in scientific education.

By and large, scientific and technological experts of the second level are recruited from among college undergraduates and graduate students, while that at the third level are mainly trained by colleges for vocational training and technical secondary schools. Of course, we must take this division of labor relatively, not absolutely. As presently structured, our higher education is homogeneous and lacks diversity. It is out of step with the need of economic construction for people at different levels of expertise. Almost all colleges of science and engineering offer a 4- or 5-year curriculum. Two-year professional training curricula are few and far between. As a result, graduates with four or five years of training behind them have no choice other than taking up work which middle and junior level scientific and technical personnel are qualified to do. To change this extremely wasteful situation, we must train a variety of experts by mobilizing the enthusiasm of existing colleges of science and engineering to offer more 2-year training courses, on the one hand, and by setting up more municipal universities and evening universities, on the other. The latter's task is essentially to offer 2 to 3-year curricula to develop personnel for local economic construction. The main difficulty that long-established schools face in increasing

recruitment is to provide room and board for students. This is also a prime problem in the establishment of new local schools. One solution is to make students commute, but this would limit student recruitment efforts. Many comrades have put forward the idea of building student dormitories, which should be seriously considered by the authorities concerned."

Liberate our Thinking, Reform Teaching and Research System at Colleges of Science and Engineering

Professor Qian Lingxi said, "the opening up of a new phase in scientific education demands that we liberate our thinking, discard old and new conventions alike, and embrace reform boldly. The basic objective of reform is to serve economic construction. Reform efforts must seek to improve both teaching and scientific research.

It has been reported recently that the Dalian Diesel Locomotive Research Institute, the Dalian Railroad College, and the Dalian Locomotive and Auto Plant have set up a "joint scientific research-education-production organization." This is a new attempt aimed at promoting economic development. As a matter of fact, a well-run college of science and engineering should be a "scientific educational complex," with the dual functions of education and scientific research. Neither teaching nor scientific research should be overemphasized at the expense of the other. A school which does not do a good job in teaching is a school in name only. On the other hand, key colleges which do not take scientific research seriously will also be disappointment to the public. Like the two wheels of a car or the wings of a bird, teaching and research must be mutually supportive and developed in a coordinated way.

From the teacher's perspective, too, teaching and research complement teach other. Throughout the past 40 years, I have been a college professor and engaged in scientific research almost without a break, except for a few years during the "cultural revolution." Moreover, I frequently take part in relevant engineering and technical experiments. To teach students how to conduct scientific research and develop technology, a teacher must have actual experience in these areas. A teacher must teach, of course, but he should not be a mere drill master, repeating what the book says. Divorced from scientific research, teaching will be cut off from the "source" of knowledge. Should that come to pass, it would be impossible to raise the standard of the entire teaching contingent of a college."

Professor Qian Lingxi said, "To ensure that an entire college becomes a 'scientific educational complex,' its basic functional units should also be able to teach and conduct. At present, the basic functional units at a college or university are the teaching and research sections, which are divided into disciplines. This kind of teaching and research sections are basically administrative organizations with little autonomy. Their size ranges from as few as 10 people or so to

as many as a little under 100. Their professional responsibilities might also range from light to heavy. This system has failed to tap the teachers' potentials to the full. In general, teaching and research sections overemphasize teaching to the neglect of scientific research. We have considered getting rid of the present arrangement and replacing it with an academic 'cell,' a smaller but more dynamic unit which can play a part in training new talent to replace the old. This academic 'cell' can be called an academic section or some other name. Compared with a teaching or research section, a 'cell' should have fewer people, say three, five, seven, or eight. Also, it should enjoy a great deal of freedom in professional activities."

"Academic 'cells' should be both teaching units and scientific research organizations. The personnel of every academic 'cell' should be reasonably proportioned as regards their areas of specialization, intellectual type and age structure. In other words, unlike the teaching and research section, an academic 'cell' can include people from different subjects, if necessary, creative types as well as those who are good at observation, experimentation and theorizing. There should be elderly teachers as well as middle-aged and young ones. Its leader should be a middle-aged teacher in the prime of life who would be authorized to recruit teachers with common aspirations to form academic 'cells' freely. Within the jurisdiction of the college, he should have control over human, financial and material resources to be used as he sees fit. By relying on his own wisdom and the best advice available to him, he is to look for research topics and find means of survival so that the institution could prosper. Inside an academic 'cell', everybody could do his own thing and work harmoniously with one another. As these 'cells' increase, they can compare and contrast, drawing inspiration from and competing with one another. We may call this socialist competition. We believe most teachers are talented. If their intelligence is given full play, they can do a lot more. On the other hand, if academic 'cells' fail to take off after a few years, they might be dissolved. Therefore they must exercise their ingenuity and strive for survival.

Practically Reform the Logistics System

Logistics problems have plagued colleges and universities for many years. Some comrades have contemplated hiving off to society all logistics and other services related to campus living, like some Western countries. This is a rational idea whose time has not come, however. We must look for a way that is suited to China's practical circumstances."

In the past 2 years, our college has delegated a little power and relaxed some restrictions, preliminarily mobilizing the enthusiasms of employees in accomplishing 10 projects to the benefit of students and staff. The living quarters for students take up over 200,000 square meters and house over 5,000 people. After 10 years of internal turmoil, it became a mess of a place plagued by robberies and thefts. One year's hard work, however, has transformed it into a tidy, attractive, quiet and

safe learning environment. This and similar changes should be attributed to the contracting responsibility system which brings together the employee's "responsibilities, rights and benefits" by means of a contract. With this as a basis, we have considered going one step further by organizing outright all logistics departments into a logistics service company. This company should be independent and separate. Each year the college should hand over to it the relevant appropriated funds along with the appropriate authority over human and material resources. At the same time the school should assign tasks to the company and make demands on it through the contract system. The hiving off of logistics units in charge of campus living is an important part of a college's internal readjustment and a basic guarantee for the college's becoming a 'scientific educational complex.'"

Colleges of Science and Engineering Doing their Part in Economic Construction

Professor Qian Lingxi said, "Many scientific and technological issues in economic construction are more or less interrelated. Their solution requires the joint and coordinated efforts of scientific and technological workers from different disciplines. Colleges of science and engineering are an important front army in scientific research and technological development. From now on, as scientific research orients itself to economic construction, an organized concerted effort remains indispensable. This requires that in tackling new scientific and technological topics all specialties must 'give' as well as 'take,' and fully cooperate with one another to make up one another's weaknesses. In terms of school construction, we must consciously support those frontier disciplines and integrated disciplines that conforms with the trend in scientific and technological development and, if possible, set up inter-disciplinary teaching and research organizations.

Teachers from the Departments of Water Conservancy, Engineering Mechanics and Shipbuilding have set up a joint organization for cooperation in marine engineering. Noting the superiority of this kind of inter-disciplinary committee, other teachers have set up two other committees on computer software and the early diagnosis and treatment of cancer, respectively. In the works are committees on energy resources and systems engineering. Certainly, such integration should not be confined to one college. Not long ago, under the direct leadership and support of the Ministry of Education, 11 affiliated colleges of science and engineering in the nation discussed joining together to vigorously develop scientific research and technological consultation work in marine engineering. I think such a move would make even greater contribution to developing China's marine resources and solving urgent energy problems in economic construction.

Recently, some municipalities and localities have approached us directly to discuss scientific and technological cooperation, which both encouraged and inspired us. We must strive to focus correctly on certain "linkage points" where scientific research resources from related disciplines can

be organized to help localities solve some urgent scientific and technological issues, on the one hand, and promote the popularization of scientific research attainments and facilitating their transformation into direct productive forces that can play a part in boosting economic results in the four modernizations, on the other hand."

12581
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IGNORANCE IMPEDING S&T DEVELOPMENT SCORED

Beijing GUANGMING RIBAO in Chinese 21 Apr 84 p 3

[Editorial by Yue Ping [1471 1627]: "Combat Ignorance, To Advance S&T Development"]

[Text] Modernization of science and technology is a strategic problem in China's economic construction. At present, an increasing number of people are studying science and technology as well as linking it with the new situation. However, there are also some comrades who neither fully understand the backward state of China's science and technology, nor do they comprehend the reality that the world's science and technology is developing daily. As a result, they simply have little interest in modern science and technology, so they lack a sense of urgency for studying and mastering them, or for reforming China's backwardness. To a certain extent, they are still in a fuzzy-minded state, even to the point of consciously or unconsciously setting up obstacles to the development of scientific and technical enterprises. This kind of situation is very inappropriate to China's modernization program.

The modernization of science and technology is an important component of the party's political line. Vigorous development of science and technology is vital to realizing the overall mission of the new era. As central authorities have clearly pointed out, we must rely on science and technology to vigorously develop the economy and realize the target of quadrupling our output. This will be a basic guiding ideology for economic construction in the future. On this question, we should consciously maintain a consistency with the party's central authorities, and promote knowledge, in order to eliminate "leftist" tendencies and overcome the ignorance that preserves the status quo.

The fact that some of our comrades neglect technical progress, and lack a sense of urgency concerning the reformation of our technological backwardness, has rather complex social and historical origins:

First, for quite a long time we lacked normal contacts with the outside world. For some time after the establishment of the People's Republic, the international situation did not permit our studying advanced foreign

technology, and errors by the "left" compounded our neglecting to study this aspect. During a decade of upheaval, not only was there no way to carry out normal international exchanges, even ordinary scientific and technical work was in a state of "hibernation." Starting in the mid-1950's, the world's science and technology made giant strides, giving rise to a series of new technologies carrying great impact. At that time, however, we were cut off from the outside world, and this put us at a considerable disadvantage. Therefore, that some comrades are today in a state of ignorance regarding science and technology, and that for a very long time we did not know much about the outside world's science and technology, are largely due to this.

Secondly, backwardness and poverty have been inseparably linked throughout the ages. When the people are ignorant of science and technology, that is a manifestation of the nation's poverty. Because the nation is poor, the cultural level is low, and it is inevitable that there will be some who are ignorant of science and technology. Another aspect of this is, because we are poor, arduously struggling for a long time, in production we do the job by local methods everyday, making do with whatever is available, repairing and using what has been discarded. Although this is an admirable style of work, a fine tradition, and this kind of spirit should be carried on, still if we do not increase analysis, just make sweeping recommendations concerning some methods, then it could easily cause people to just muddle along in thought, and lack enthusiasm for renewal of equipment of technical improvements.

Third, there are various evils inherent in our system of management which cause some comrades to maintain a conservative, backward state of affairs, and to moreover do this with an easy conscience. Because we can all eat at the "common mess hall," an enterprise's investment funds come from the state, the equipment replacement is regulated by the state, and there is little competition between enterprises. Therefore, an enterprise's technological situation has little common interest with local units' leaders and workers. The result of this is that inferior products which should be eliminated are not being discarded, and products which should be popularized do not get out. This has already caused some comrades to lack enthusiasm for new science and technology.

Fourth, the influence of a long period of "leftist" thinking has caused some of our comrades to adopt an apathetic attitude towards scientific and technological progress. Some comrades pay attention to criticizing capitalism's rotten system and thought, and this should be approved. However, we should not neglect our understanding of and research into the accomplishments and trends of international science and technology, nor under certain conditions to even lump the advanced science and technology of capitalist nations in with capitalist system and thought,

not daring or wanting to study, learn from, and put their experiences to use. There are also some comrades who have a "leftist" bias regarding scientific and technical personnel, being unsupportive of their research activities, putting no value on their achievements, and mistrusting them politically.

In the present circumstances of a worldwide technical revolution, cadres who undertake leading roles in the four modernizations drive should have ambition, confidence and judgment, to mobilize on a large scale the enthusiasm of scientific and technical cadres, and of workers for studying science and technology. They must realize fully the strategic significance of science and technology in the development of our national economy. They must conscientiously study science, technology, and scientific knowledge, conscientiously advancing the development of these subjects, and using them as an important means of initiating a new situation. The development of science and technology not only push forward the development of production, it also must have a profound influence on various aspects of life in our society. In the present circumstances, regardless of the front of endeavor, regardless of which department's leading comrades, all must have a firm grasp of the essentials of scientific and technical knowledge. Party central authorities have proposed that making the cadre ranks more revolutionary, younger in average age, better educated and professionally more competent and studying and grasping definite scientific and technical knowledge is integral to achieving the four modernizations of cadres. Recently, central authorities' concerned units conducted a course of lectures on knowledge of the new technical revolution. This will assist cadres in understanding the new technical revolution that is just now arising in the world, thereby getting a clear understanding of the situation, expanding their thinking, and broadening their knowledge. The hope is that our cadres, in addition to seriously studying Marxism-Leninism and Mao Zedong Thought, and studying the party's line, principles and policies, will also in various ways energetically acquire some knowledge of modern science and technology, and rapidly change this state of ignorance, so as to better carry out the party's general line, general mission and struggle.

12625
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NATIONAL DEVELOPMENTS

SCIENTIFIC DELEGATION RETURNS FROM JAPAN

Beijing GUANGMING RIBAO in Chinese 21 Apr 84 pp 1, 3

[Article by Jiang Daoding [5592 6670 7844]: "Enthusiastically Welcome the Challenge of the New Technical Revolution; Comrade Fang Yi and his Delegation Give Their Impressions of Visits With Japanese Scientific and Technical Personnel"]

[Text] From our Tokyo correspondent Jiang Daoding. After making a friendship visit to Japan at the invitation of the Japanese Science and Technology Agency and the Japan-China Association, State Councilor and Minister in Charge of the State Science and Technology Commission Fang Yi and his party recently discussed their impressions from that visit. He pointed out that we are now just in the midst of a new technical revolution in Japan and other Western nations which merits our serious attention. This is because it is not only supplying us with important information, it is also presenting us with a serious challenge, a challenge we should welcome enthusiastically.

Fang Yi's delegation arrived in Tokyo on 10 April and returned home on 18 April. During their time in Japan, they visited a series of scientific research organizations, called on Japanese governmental leaders, visited old friends in the S&T community, and held wide-ranging talks with concerned public figures on Sino-Japanese scientific and technical cooperation.

Scientific and technical personnel accompanying Fang Yi on his visit to Japan are certain that in order to welcome this challenge of the new technical revolution, we must exert our efforts in the following several areas:

First: Heighten Recognition of Science and Technology as Productive Forces.

State Scientific and Technological Commission Member and senior engineer Hu Zhaosen [5170 0340 2773] said that in the 7 years since he had last visited Japan, he sensed that Japan had indeed made obvious progress in new S&T fields. In the past Japanese fundamental, theoretical research was relatively weak, but now they are not only catching up, they have

attained results. In his contacts with Japanese scientific and technical personnel he felt that the reason the Japanese were stressing development of science and technology so seriously was that they recognized clearly that science and technology are productive forces. "Technology builds the nation," has already become the general plan of their nation-building, so regardless of whether it is a governmental or private enterprise, all are willing to pay out large amounts of capital for research funding and personnel training. These past several years, it has often been advocated here that science and technology be recognized as productive forces, and yet the idea has not been popularized. Wang Shoujue [3769 1343 6030], Director of the Institute of Semiconductors in Beijing, has pointed out that in order to implement fully the strategic policy of "Economic construction must rely on science and technology; scientific and technical work must be geared to the needs of economic construction," it is essential first to heighten the awareness of the entire nation that science and technology are productive forces. Moreover we must really put ourselves totally into the effort, for it is only in this way that we will not fall behind in the tide of the new technical revolution.

Second: We Must Increase Coordination and Overcome Decentralization.

Shi Changxu [1597 2490 4872], Member of the Scientific Council of the Chinese Academy of Sciences, thinks that if there is a gap between our research work and Japan's, then the discrepancy lies in our management of science. The greatest critical point influencing our research work is decentralization: decentralization of funds, of personnel, of projects, of results. New research results and abilities will not become evident until our present system of science management is reformed. At present our country is still comparatively poor, and it is really difficult to obtain more money for doing research. However, if we concentrate our limited strength, do a better job of coordinating, and set out from the foundation we have now, we can definitely achieve more high level results. Shi Changxu stated that Japan has emphasized making maximum use of their research personnel. In order to prevent a foreign drain on their "mental resources," they have adopted many important measures. In Japan, scientific research work is an "iron rice bowl," but research workers do not eat in the "common mess hall." When we arrange science research projects, although we have been giving some attention to this, there still exists the serious phenomenon of egalitarianism. On some projects everyone squeezes in, with the result that no one does the job well. It seems that those science research units which are competitive and those research personnel who are genuinely talented adapt and select exceptional measures. In order for them to create even better conditions, it is necessary to let them earlier produce results.

Third: Pay Attention to Assimilating Foreign Nations' Strong Points, But Don't Underestimate Our Own Capabilities.

Yandong Daoxing [phonetic], Head of the Japanese Science and Technology Agency, spoke on the development of Japan's science and technology, and left a deep impression on the visiting delegation of Chinese scientific and technical personnel. He said that today's science and technology accumulated over the course of mankind's historical development, and is the crystallization of mankind's intelligence. China's ancient science and culture had a very great influence on Japan, and China's iron-smelting technology pre-dated that of Europe's by several centuries. At the present time, mankind is paying more attention to the utility of science and technology than at any other time. We should carry on the things of early man, absorbing his strong points. China has much that is worthwhile for Japan to study, and Japan has much that is worth China's investigation. Professor Cao Tianqin [2580 1131 2953] of the Shanghai Biochemistry Institute said that this statement of Mr. Yandong was brimming with friendly sentiments as well as to the point. The intelligence and ability of the Chinese certainly is not less than that of other peoples, nor are our scientists inferior in the world; moreover, we have many particular resources and natural conditions that other nations lack. We should pay attention to adopting the strong points of foreign nations, but there is no reason for us to belittle our own capabilities.

Fourth: Basic, Fundamental Matters of Importance Are Dependent Upon Our Exploiting Talent.

Professor Cao Tianqin stated that, in order to meet the challenge of the new technical revolution, it is most important that we stress education, increasing our intellectual investment. Ever since the Meiji Restoration over a hundred years ago, Japan has put a particular empnasis on education; even during their most difficult time, the postwar era, they did not relax in this. Scientific research is like a relay race: we cannot just pay attention to the last runner. With our abundant human resources taking root in the rich soil that is the Chinese people's culture, we can then definitely build a brilliant and magnificent future.

12625
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RESEARCH MANAGEMENT REFORMS IN ANHUI

Beijing RENMIN RIBAO in Chinese 26 Apr 84 p 3

[Article by Zhang Chunsheng [1728 2504 3932] and Zhang Zhenguo [1728 2182 0948]: "Anhui Province Reforms its System of Managing Scientific Research"]

[Text] The Anhui Provincial CCP Committee and the Anhui Provincial People's Government, based on a summary of the successful experiences of the China University of Science and Technology's Chemistry Teaching and Research Section, the Provincial Chemical Engineering Research Institute, the Hefei Electronics Research Institute, and other units in reforming their systems of managing teaching and research, on 18 April made a decision to boldly carry out throughout the Province reforms of the system of research management.

The main high lights of these reforms are:

Reform of the method of funding whereby the funds for research units are all "wrapped up by the state." From now on, science research projects will be carried out on a contractual basis, with operating expenses given partly in cash and partly in supplies, progressively moving to independent accounting, with self responsibility for profit and loss, not taking operating expenses. Each research unit, on the premise of guaranteeing completion of scientific research projects assigned by the state, will furnish various kinds of technical services to economic departments. In their professional work, these units accumulate additional funds, and the state possibly does not levy taxes, other than those funds which must be turned in for construction of high priority national energy and transportation, the rest all may be retained in the units.

Of that part of the profits retained by the research units, the larger share of these will be used as research and development funds, and a portion will go for collective welfare funds and awards to individuals. The bonuses awarded will follow the fluctuations in earnings, with small profits progressively increasing, and large profits progressively decreasing, but not fixed. Distribution of bonuses will not be on an

egalitarian basis, rewarding the industrious and penalizing the indolent, permitting and encouraging a portion of those intellectuals who have worked well and made major contributions to be the first to begin accumulating some wealth. Those research workers who have had outstanding successes can move upwards on to two grades in pay, and the funds required for this will be paid out as bonuses to individuals. Those individuals who are unsuccessful in their research, or who have not made contributions in spreading results, or who have not worked well, will not receive bonuses, and may possibly drop to a lower level in wages.

Science research units, on a basis of reorganization, will step by step implement a system whereby personnel have fixed arrangements, fixed quotas and fixed missions, and encourage them to implement a contract system for research projects. These contracts must be resolutely honored.

Expand research units' right to control of their own property. A strong point is the appointment of persons responsible for the units' administrative functions who will have the power to allocate and use the local unit's operating expenses, continue outside research missions and optional research topics, and purchase research equipment and materials according to needs. Within this they can implement a cabinet system for research section heads, and can also implement the project organizing personnel's freedom to reallign. Another strong point is the power to reject and transfer persons not needed by the research unit. This transfer power is a backbone of science and technology, and cannot be restricted.

Encouragement will be given to the teaching and research sections of higher education institutions (including middle level vocational schools) in the premise that when they complete teaching and research missions handed down from the state, or provide various kinds of technical services for society, other than that portion of the profits which must be turned over to the school, the remainder of the profits can be retained by the teaching and research sections for their own use. Such matters as paying operating expenses, methods of awarding bonuses, etc., by and large can be carried out according to the methods of the aforementiond research units.

Enterprises which are technologically strong will be encouraged to send technical service teams to those enterprises which are technologically weak to accomplish research contracts. Those which achieve notable successes or achieve outstanding economic benefits, there will be additional income awarded by the local government.

Precedence will be given to expanding the use by various central departments of the research results of Anhui's research units and institutions of higher education, and those which have obvious economic benefits should be rewarded from local finances or directly from the Scientific Commission. These funds will be given to the concerned research unit, and then extended to the meritorious personnel.

The Provincial Committee and the Provincial People's Government have made a special request that every department and every unit eliminate "leftist" influences, doing away with styles of management, styles of activity and styles of thinking which are inappropriate to the new situation and new mission, resolutely supporting reform of the provincial system of scientific and technical management.

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CSO: 4008/287

on a submarine or on a surface vessel the camera vehicle can automatically move forward, backward or change direction. Since a video cable must be used at present to transmit a signal from the television camera, the cable restricts the motion of the camera, preventing it from moving freely underwater. Therefore the video cable is an obstacle to the development of the camera into a completely free type. Resolving this problem is an important problem awaiting the attention of scientific researchers.

The underwater camera operates in a high-pressure, high-moisture environment. Therefore the selection of its materials, design, source of illumination and lens must be done with special care.

First of all the surface of the camera must be constructed of very strong pressure resistant, corrosion-resistant materials. Structurally, the cylindrical shape is currently regarded as the best. The requirements for the seal between the video cable and the surface of the camera are also very demanding. Now most use special double seals and automatic knock-off alarms for the penetration of water into the camera.

Secondly, the refractive index of light in water is about three quarters that it has in the air. Therefore, a lens with the same specifications fused in water will have an angle of view of only about 75 percent of what it has on land. Therefore, underwater cameras commonly use wide-angle lenses to make up for the insufficiency in the angle of view.

Once again, underwater illumination is a problem on which scientific workers are always doing research and making progress. We know that sunlight can only penetrate 20-30 m beneath the surface and that the loss of visible light in seawater is very high. This loss is caused by the absorption and scattering of light by seawater, thereby hindering its effective transmission in the water. Now most cameras use blue-green light (about 5000 Å), which has a lower loss in seawater, for illumination. Compared with an equivalent complex spectral light source, blue-green light has a radius of vision which is as much as six times larger as the spectral light. Since laser light and ultrasonic sound waves have little loss in water, scientists are searching for the development of underwater laser television and underwater ultrasonic television, a newer and better line of development.

To serve the opening up of the mysteries of the ocean depths and as a front army in the exploitation of the ocean, underwater television will develop towards higher freedom, sensitivity, color television, miniaturization of the camera and durability. We can say for certain that underwater television will gradually get better and better.

12369
CSO: 4008/397

AIRBORNE REMOTE SENSING CCD IMAGING SYSTEM

Beijing DIANZI XUEBAO [ACTA ELECTRONIC SINICA] in Chinese No 1, 1984 pp 96-99

[Article by Ma Zongquan [7456 1350 2938] of Xian Institute of Radio Technology:
"An Airborne Remote Sensing CCD Imaging System"]

[Abstract] This paper introduces an airborne remote sensing CCD imaging and transmission system. Imaging formulas were derived. The equation expressing the signal to quantized noise ratio with delta modulation was also given. Finally, experimental results were presented.

[Text] I. Introduction

The experimental system included: a linear array CCD camera, digital video transmitter, receiver, terminal display, and recording device. The airborne portion was comprised of a camera, antenna and digital transmitter. The total weight is less than 5 kilograms and the power consumption was less than 12 W. The major technical indicators are as follows:

Camera:

resolution (MTF$\geq$5%)	800 picture element/line
lens focal length	120 mm
signal to noise ratio	$V_{pp}/Qn\geq$35dB
(mean square root noise σ_n included in interference component ϕ_R of CCD)	
brightness range	$\geq$32dB

Imaging parameters:

flying altitude	1,000m, 2,000m
flying speed	30m/s, 60m/s
receiption width	130m, 260m
ground resolution	0.1625m, 0.325m

Digital Transmission System Parameters:

transmitting frequency	270 MHz
transmitting power	1.5W
transmitting range	100Km
modulation mode	FSK
code rate	1.5 Mb/s

Terminal Display (Low Frequency Television)

horizontal frequency	200 Hz
vertical frequency	0.26 Hz
recording	synchronous camera

The photograph taken on the ground by a manual method and a picture transmitted to the ground by the airborne imaging system are shown in Figures 1 and 2, respectively.

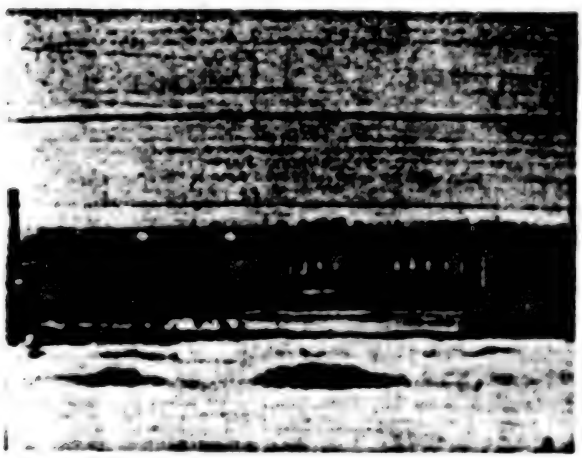


Figure 1. Manual Scanning Picture (object distance 1200m)

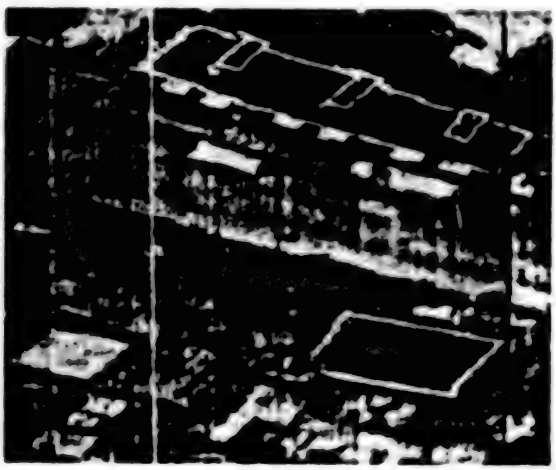


Figure 2. Transmitted Airborne Image (cloudy, 2000m altitude)

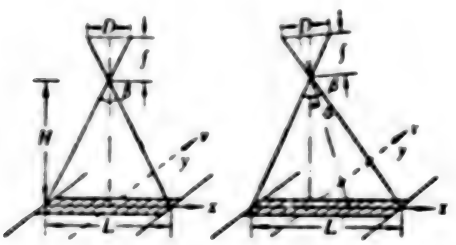
II. Analysis of CCD Linear Array Imaging

The linear array CCD photographic equipment at Yongchuan Institute of Optoelectric Technology was used. There are 1,024 light sensing elements. The phototaking process was driven by an electronic logic circuit. A row of picture elements was obtained after one reading and reset. The picture of ground objects could be obtained with the aid of the uniform linear motion of the airplane. Figure 3 shows the geometric relation in the imaging process when the major optical axis of the lens is perpendicular to the ground or at an inclined angle. In the figure, D is the length of the CCD linear array, f is the focal distance of

the lens, H is the altitude of the aircraft, v is the cruising speed and L is the ground receiption width. From the geometry, we have the following relations for direct vision and sideway vision, respectively.

$$L = DH/f \quad , \qquad L' = L/\cos \alpha$$

One can see that the view is geometrically distorted when viewing sideways.



(a) direct vision (b) sideway vision
Figure 3. Geometry of CCD Imaging

2. Speed to Altitude Ratio and Vibrational Blurring

The CCD linear array photographs of the ground view based on a two-dimensional sampling process. In Figure 3, the sampling interval in the x direction, dx, is determined by L and the number of light sensors m. The sampling interval in the y direction, dy, is determined by v and the CCD scanning cycle T_L. Their relations are:

$$dx = L/m \quad , \qquad dy = vT_L$$

In order to keep the scale in the x-direction the same as that in the y-direction for the image, usually dx=dy. Using the formulas described earlier, one can get the flight speed to altitude ratio:

$$v/H = D/fmT_L$$

The image sampling rate S_b is equal to the sampling rate of the CCD output, i.e. $S_b = m/T_c$, where $T_c \approx 0.8T_L$. When the sampling theory is satisfied, the visual frequency signal bandwidth is

$$B = S_b/2$$

There is no motion blurring problem in CCD imaging. However, the image is blurred by the vibration of the airborne platform. If the vibrational blurring is supposed to be less than a picture element, then it is required that the mean square trembling angle on the major optical axis of the lens $\alpha \leq \sin^{-1} dx/H$ (referring to the geometry in Figure 3).

The $\Delta\alpha$ for this system was found to be 0.3m rad. The shock-proof requirement of the airborne platform is very rigorous for high quality images. Image blurring due to vibration has already been shown in Figures 1 and 2.

3. Effect of CCD Imaging Element on Resolution

The exposure area of the CCD imaging elements is $\Delta s = \Delta x \Delta y$. Under the same brightness, the output photoelectric voltage is proportional to Δs (see Figure 4). If the brightness function of the ground image field is $\phi(x,y)$ and the corresponding visual frequency signal of the light sensor output is $F(x,y)$, then $F(x,y)$ is proportional to the surface integral of $\phi(x,y)$. Hence, in order to increase light sensitivity, Δs is increased to the extent possible. In order to raise the resolution in the x-direction, Δx must be decreased. Therefore, a light sensor is usually rectangular. Under normal sampling conditions, the resolution in the y-direction is usually lower than that in the x-direction. This type of blurring may be eliminated by using overlapping sampling in the y-direction followed by the partial differentiation of $F(x,y)$ with respect to y. This process should be performed by a computer.

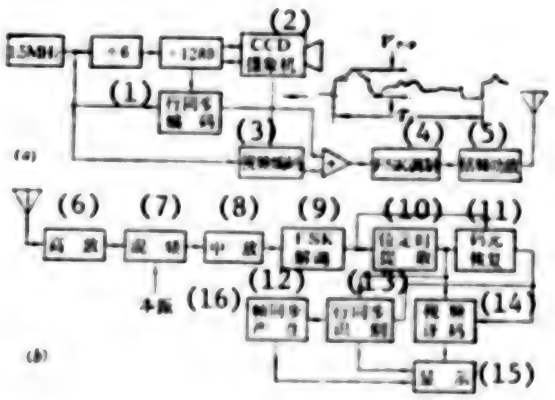


Figure 4. Block Diagrams of (a) data transmitter, (b) receiver

Key:

1. Synchronous coding
2. CCD camera
3. Video frequency coding
4. FSK modulation
5. Frequency doubling amplifier
6. High frequency amplifier
7. Frequency mixer
8. Medium frequency amplifier
9. FSK demodulation
10. Position timing extraction
11. Code element regeneration
12. Frame synchronization regeneration
13. Identification of horizontal synchronization
14. Visual frequency decoding
15. Display
16. Resonance

III. Design of Data Transmission System

An increment modulation method was used for information coding in this data transmission system. The optional synchronous code group was used in horizontal sychronization. FSK modulation was used for the information channel. The receiving end was demodulated incoherently. Position timing information was obtained from the data code. The horizontal sychronization codes were correlatively identified. The block diagram is shown in Figure 4.

1. Increment Modulation

The increment modulation adopted is shown in Figure 5. Using signal coding brings about a loss in picture quality due to two aspects: one is quantitized noise and the other is slope overload. These two types of noises have already been quantitatively analyzed in the literature[1,2]. However, a satisfactory formula has not yet been found. For remote imaging, in order not to lose picture resolution, it is necessary to avoid the slope overload of the coder. For this reason, the maximum varying rate of the video frequency signal in this system was determined by the modulation transformation function MTF of the camera and the black and white peak voltage of the video frequency signal:

$$\xi_{max} = \frac{V_{\rho\rho} \cdot MTF}{T_1/m} = V_{\rho\rho} \cdot MTF/T_\rho$$

Where $T_\rho = T_1/m$ which is the time interval occupied by each picture element. When the slope load of the increment modulation coder is equal to or greater than ξ_{max}, the slope overload noise is zero.

If we denote the jump of the increment modulator to be Δu and the feedback cycle to be T_F (signal channel coding rate $R_b = 1/T_F$), then the maximum slope load of the the coder is $Z_{max} = \Delta\mu/T_F = \Delta\mu \cdot R_b$. When no slope overload exists, the channel coding rate is

$$R_b \geq \frac{V\rho\rho \cdot MTF}{\Delta u \cdot T_p} = \frac{V_{\rho\rho} \cdot MTF}{\Delta u} 2f_{max}$$

where $f_{max} = 1/2\ T_\rho$ which is the highest frequency component or bandwidth of the video frequency signal. The coder in this instance, only procedures quantized noise. Its power[3] is

$$D_g = \Delta\mu^2/12$$

Corresponding to the highest frequency component of the signal, the peak signal is $V_{\rho\rho} \cdot MTF$. The signal to noise ratio is

$$SNR\ f_{max} = \sqrt{12} \cdot n = 10.8 + 6 \log_2 n \quad (dB) \qquad (1)$$

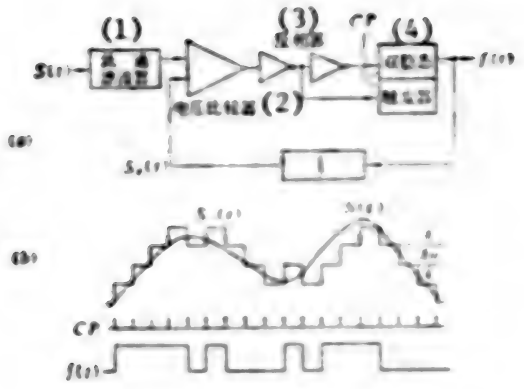


Figure 5. Increment Modulation and Waveform

Key:
1. Low pass filter
2. Voltage comparator
3. Phase inverter
4. Dual stability trigger

In equation (1), $n = T_p/T_F$ which is the coding bit per picture element. The result of equation (1) agrees more with the empirical formula in Reference [5]. For low frequency components, the peak signal is 1/MTF of the highest frequency component. Therefore, the peak signal to noise ratio is

$$SNR\ f_{min} = 10.8 + 6\ Log_2 n - 20\ lg MTF\ (dB) \qquad (2)$$

Generally, the low frequency signal to noise ratio is 20-26 dB higher than that of high frequency when MTF = 5-10 percent. This system adopted a 6 bits per picture element coding. We can obtain $SNRf_{max}$ = 28 dB and $SFRf_{min}$ = 54 dB. Furthermore, there is no slope overload noise. The visual frequency signal before coding and after decoding are both shown in Figure 6. It is evident that the signal was not distorted. There is no subjective quality loss due to image data transmission.

2. Extraction of Position Timing, Regeneration of Code Element and Identification of Horizontal Synchronization

The code data transmitted by the FSK demodulator on the receiving end underwent amplitude limiting, differentiating and rectifying. The position timing signal was extracted by a narrow band filter. The channel code rate was 1.5Mb/s. The bandwidth of the narrow band filter was 490Hz. When the signal to noise ratio $V_{\rho p}/\sigma \leq 15$dB, the flutter was less than 20ns.

图6 视频信号，原始信号(上)，译码后信号(下)

Figure 6. Video Frequency Signals: original signal (above)
decoded signal (below)

An integrated reset circuit was used to regenerate the data coding element. In order to fully utilize the energy of the entire coding elements, the sampling judgment pulse provided by position timing was fixed at the end of the code element through delay. The integrator was a primary RC filter, BT=0.2. The output signal to noise ratio is only 1dB lower than that of the best filter[4]. The actual measurements are : when T=0.667μs and B=300KHz, the miscode rate was $P_e \approx 10^{-5}$ at $V_{\rho\rho}/\sigma$=20dB, which is very close to the theoretical value.[4]

The system used the optimal sychronous code structure.[5] It is 12 digits long and the code type is 000001101011. The transmitting end sends it three times and the receiving end identifies it correlatively based on the chosen synchronous code. If more than two horizontal synchronous codes appear consecutively during the time interval in which three horizontal synchronous codes last, they were determined as a horizontal synchronous code and transmitted. Hence, the probability of misjudging a horizontal synchronous code due to channel miscoding is

$$P_{en} = \sum_{t=2}^{3} C_3^t (NP_e)^t \approx 3N^2P_e^2$$

where N is the code length. By substituting N=12 and $P_e=10^{-5}$, we can obtain $P_{en}=4.32\times10^{-8}$. The probability of misjudging due to the horizontal synchronous code in the picture data code is $P_{em}=2^{-2N}$. Assuming the probability for 0 or 1 to appear in the data is equal to 1/2, we get $P_{em}=1.6\times10^{-7}$.

The probability of error in horizontal synchronization is $P_{en}+P_{em}$. Once it steps out of phase, synchronous capture can be accomplished in the next synchronization cycle. The effect of asynchronization on picture quality was not observed in the experiment.

3. Channel Calculation

The relation between the actual field strength and free space field strength in ultrashort frequency transmission is[6]

$$E = E_o \prod_{t=1}^{n} S_t \prod_{t=1}^{n-1} A_t = E_o L_{SA}$$

Where E_o is the free space field strength. The two term product is the reflective and diffractive loss on the transmitting path (expressed as L_{SA}). The specific values can be looked up in the table. For a given transmitter and receiver in a system, when $P_e \leq 10^{-5}$, the calculated transmission distance is 86km (if altitude is 2,000M, the distance is increased to above 100km). Experimental results showed that the residual signal to noise ratio of the output of the incoherent demodulator of the FSK receiver was 6 ~9dB. It is more or less in agreement with the calculated results.

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CSO: 4008/382

METHOD FOR INCREASING LINEARITY OF LOAD CELL

Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 1, 1984 pp 103-106

[Article by Wu Xianyi [6762 7359 5030] of Changchun Institute of Prototypes, Ministry of Machine Building: "A Method of Increasing the Linearity of Load Cells"]

[Text] I. Principle and Practice of Linearity Compensation

The output characteristics of a strain load cell often show a certain degree of non-linearity due to factors such as the elastomer, the foil gage and the bonding agent. The use of a semiconductor foil gage to compensate for linearity is an effective method. The compensation principle is as follows (using a cylindrical pressure transducer as an example in the analysis and calculation):

The semiconductor piece was adhered to the elastomer axially (Figure 1). It was connected to the bridge circuit (Figure 2). When the elastomer is shortened by pressure, the resistance r of the semiconductor is also reduced. Because r and the input resistance of the bridge circuit R_{AC} form a serial bleeder circuit, if E is a constant voltage source, then the actual bridge voltage U_{AC} also increases with increasing load. However, the output voltage Δ E is proportional to U_{AC}. Therefore, the slope of the output characteristic curve gets larger as the load increases; creating a non-linear effect (Figure 3). If the non-linearity of the measured value, prior to compensation is equal in absolute value and opposite in direction as this effect, then the linearity is compensated. In order to adjust the magnitude of compensation, in addition to varying the no load resistance of the semiconductor r_o and its sensitivity coefficient K_r, a coil resistor r_p was placed parallel to r. when on appropriate r_p value is chosen based on the actual condition, linearity compensation can be optimized.

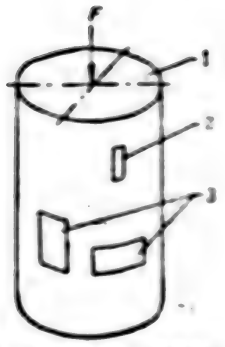


Figure 1. Load Cell

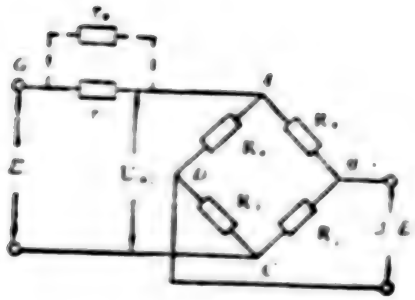


Figure 2. Bridge Circuit

Key:
1. Elastomer
2. Semiconductor
3. Bridge foil gage

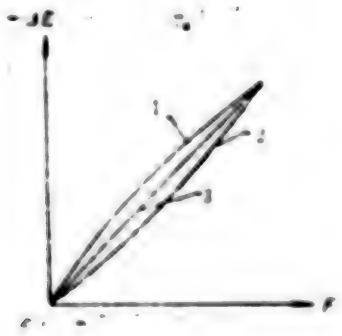


Figure 3. Output Characteristics of Load Cell

Key: 1. Before
2. Compensation
3. After

II. Formula Derivation

From the circuit shown in Figure 2, one can write:

$$U_{sc} = \frac{R_{sc}}{R_{sc} + R_{0s}} E \qquad (1)$$

The output voltage ΔE of the bridge circuit after a strain ε was produced by pressure on the cylindrical elastomer is

$$\Delta E = \frac{1+\mu}{2} K \varepsilon U_{sc} = \frac{1+\mu}{2} \cdot \frac{R_{sc}}{R_{sc} + R_{0s}} K \varepsilon E \qquad (2)$$

where μ is the Poisson's ratio, k is the sensitivity coefficient of the bridge foil gage and R_{GA} is the equivalent resistance between G and A.

The input resistance of the bridge R_{AC} is:

$$R_{ac} = \frac{(1 - K\varepsilon)R_0 + (1 + \mu K\varepsilon)R_0}{2} = [1 - 0.5(1 - \mu)K\varepsilon]R_0 \qquad (3)$$

where R_0 is the no load resistance of the foil gage in the bridge circuit; assuming all 4 pieces are equal, i.e., $R_1 = R_2 = R_3 = R_4 = R_0$.

The resistance of the semiconductor r is

$$r = (1 - K_r\varepsilon_r)r_0 \qquad (4)$$

where ε_r is the strain on the semiconductor and $\varepsilon_r = \varepsilon$ in this case.

$$R_{ac} = \frac{r \cdot r_p}{r + r_p} = \frac{(1 - K_r\varepsilon_r)r_0 r_p}{(1 - K_r\varepsilon_r)r_0 + r_p} \qquad (5)$$

By substituting equations (3) and (5) into (2), we get

$$\Delta E = \frac{1 + \mu}{2} \cdot \frac{[1 - 0.5(1 - \mu)K\varepsilon]R_0 K\varepsilon E}{[1 - 0.5(1 - \mu)K\varepsilon]R_0 + \frac{(1 - K_r\varepsilon_r)r_0 r_p}{(1 - K_r\varepsilon_r)r_0 + r_p}} \qquad (6)$$

The formula above is the characteristic output function of a cylindrical pressure load cell after linearity compensation by a semiconductor. Similar methods can be used to derive characteristic output functions of other types of load cells.

III. Relation Between Compensation Characteristics and Various Parameters

1. Compensation Characteristics With Typical Parameters

The parameters of a load cell are: R_0 = 350 kohm, K = 2, full load strain ε_{FS} = 1870 microstrain, r_0 = 26 ohm, K_r = 100, μ = 0.28, ε_r = and there is no r_p. The characteristic compensation curve could be obtained by calculation as shown in Figure 4. It is symmetrical with a maximum of -0.32 percent F.S. in the middle. With these parameters, the maximum compensation is -0.32 percent F.S.

2. Relation Between Compensation and Various Parameters

When a certain parameter changes, the compensation characteristic also varies correspondingly. Figures 5 (a) - (e) show the correlation between maximum compensation and varying R_0, r_0, K_r, and r_p based on the set of parameters described above.

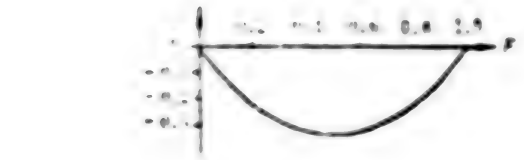


Figure 4. Compensation Characteristics With Typical Parameters

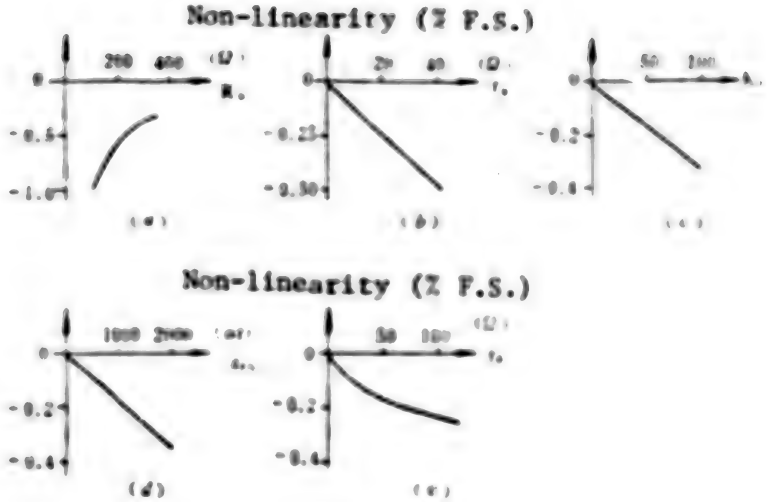


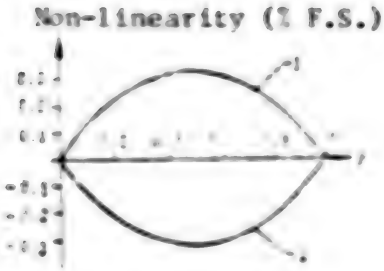
Figure 5. Maximum Compensation Versus Various Parameters

3. Compensation Characteristics of the Same Load Cell Under Stress

By referring to the derivation of equation (6), we get the following characteristics output function under stress.

$$\Delta E = \frac{1-\mu}{2} \cdot \frac{[1+0.5(1-\mu)K_\sigma]R_0K_0E}{[1+0.5(1-\mu)K_\sigma]R_0+\frac{(1-K_{\sigma_0}\sigma_0)r_0\rho_0}{(1+K_{\sigma_0}\sigma_0)r_0+\rho_0}} \qquad (7)$$

By using the same parameters in equations (6) and (7), we obtained the compensation characteristic curve shown in Figure 6. As one can see that the two curves are equal in absolute value and opposite in direction.



1. tension 2. pressure

Figure 6. Compensation Under Load and Stress

IV. Practical Significance of Linearity Compensation

We conducted linearity compensation experiments with five 10-ton cylindrical strain load cells. The linearity data before and after compensation is shown in Table 1. It proved that semiconductor compensation has the following advantages:

Table 1

1.	1	2	3	4	5
2.	+0.23	+0.20	-0.11	+0.14	+0.10
3.	+0.	+0.006	+0.007	+0.009	+0.005

Key:
1. Load cell no.
2. Linearity prior to compensation (% F.S.)
3. Linearity after compensation (% F.S.)

1. Effectiveness. Linearity could be improved from 0.2 percent F.S. to above 0.015 percent F.S.

2. Simplicity. Adhesion of semiconductor is the same as for a foil gage.

3. Easy to Adjust. The external parallel resistance r_p can be used to fine tune the compensation. Therefore, it is easy to accurately compensate for each load cell successfully.

4. Low cost. The Chinese made semiconductor for compensation costs 15 yuans. The parallel resistor is a few yuans. The economic benefit far exceeds the cost.

5. Stability. Because the semiconductor is connected in series outside the bridge circuit, the zero output of the circuit will not be affected by the variation in resistance with temperature or time. However, the output sensitivity coefficient of the load cell will vary. The temperature coefficient of the resistance of the Chinese-made semiconductor used was measured to be $2-4) \times 10^{-4}$ /°C. Based on the aforementioned typical parameters, the temperature variation of the sensitivity coefficient of the load cell output is (-0.0014 ~ -0.0028)

percent/°C. This is not only negligible relatively to the temperature coefficient of the modular of the elastomer (approximately 0.03 percent/°C), but also opposite in direction and slightly compensating. Besides, linearity compensation can be performed in the process first and sensitivity coefficient correction can follow. The temperature effect caused by the former process can be eliminated by an overall compensation in the latter step. The long-term stability was evaluated by testing 10 different load cells over long periods of time. Experimental results show that the variation in sensitivity coefficient in 3 years was less than 0.02 percent. Although semiconductors were used, their long-term stability still could be maintained at a high standard.

6. Flexibility. It not only can be applied to cylindrical elastomers but also to the square bar, flat cup, wheel spoke, and beam types. If the compensation characteristics need to be changed, the direction of the semiconductor may be rotated by 90°.

The use of semiconductor to compensate the linearity of a load cell is technically feasible and reasonable. Its economic benefit is also substantial. This method has already been widely used in high precision sensors abroad and will be expanded in China.

12553
CSO: 4008/379

FIRST DISCOVERY OF IMPACT CRATER IN CHINA

Shanghai ZIRAN ZAZHI [NATURE JOURNAL] in Chinese No 2, 1984 pp 116-118

[Text] At the end of 1982, on the basis of study of satellite and aerial photographs, it was decided that the cauldron-shaped basin at Loudoushe in Guangdong Province's Shixing County was very likely a meteorite impact crater. In January 1983, field studies were carried out as well. Through observation in the field as well as laboratory investigation, many geological, petrological and minerological indicators of deformation due to high speed impact have already been found. These include: an overturned flap at the rim, impact melt rocks, impact breccia, diaplectic glass, shock micro-lamellae in quartz, etc. Therefore, this is China's first meteorite crater.

The Longdoushe meteorite crater is located 45 km southeast of Shaoguan City in Guangdong Province. The geographical co-ordinates are: east longitude 113°55' and north latitude 24°43'. The meteorite crater's diameter is 3.2 km wide, is 250 m deep, has a circumference of 10.3 km and an area of 8 square km. In a computer enhanced color photograph, the meteorite crater has typical circular structure with debris radiating from the center outwards. In an area photograph on a scale of 30,000:1, it can be seen that both the crater's northern and southern edges have curved overturned rims.

The Longdoushe crater is located at the northern edge of a body of Caledonian Guidong granite, in a contact zone of Middle Devonian sandstone and Guidong granite. There is a long variation in the kinds of rocks making up the northern and southern rims in the altitude of the rocks and the slope of the rim. The northern rim is Longtoushan. It is composed of Middle Devonian sandstone mica sands and sand. From the top of the rim to the bottom of the crater it is more than 700 m. The interior slope of the rim is 70°, the exterior 50° forming a precipitous cliff. On the top of the mountain pieces of debris 1-2 m thick are commonly seen. The southern rim is composed of Guidong granite. It is about 250 m from the top of the rim to the bottom of the crater. The interior slope of the rim is 50°, the exterior 30°. The thickness of the rim is fairly even, about 5-8m. It spreads in a curve for more than 3 km.

On the eastern peak of Longtoushan on top of the sandstone rim the characteristic overturned flap structure of the meteorite crater can be seen. The layer of rock slopes at an angle of 70°, so the overturning is at about a 20°

angle. Some distinctive rocks were found in the area. Upon analysis, it is believed that they are impact melt Guidong granite. This type of impact melt rocks are colored ashen yellow, are massive with a compact texture, a pseudo phenocryst structure, and psuedomorphs of quartz, mica and feldspar. The phenocrysts make up about 5 percent of the rock. The quartz phenocrysts often have micro-lamellae and mostly have been fused into the shape of a bay. The pebbles on the edge are composed of quartz and particles of mica. Mica have completely replaced feldspar phenocrysts, retaining the almost perfectly rectangular appearance of the feldspar. The substratum is composed of allothimorphic mica particles and white mica crystallites.

Ordinarily, the composition and structure of impact melt rocks, especially their chemical and mineralogical composition is very closely connected to the composition of the original rocks in the impact zone. The original rocks of the two Canadian craters described above were plagioclase, granitic diorite and gneiss, while some of the original rocks of Longdoushe crater were black mica granite. Therefore although it is very difficult to make comparisons between impact melt rocks from different craters, there is clearly a very great similarity in structure and in the make-up of the phenocrysts.

The western peak of Longtoushan, a rim composed of sandstone, and large slabs of impact breccia can be seen. These rocks are relatively hard and massive. The breccia is composed of devitrified quartz and quartzite sand. The breccia are usually light grey. The biding material is brown-colored particles of sand, composed principally of microcosm particles of quartz, mica, mud and iron. Most of the mica particles have been melted into a bay-like shape. Some clearly have micro-lamellae and have heavy crystals growing on the edges.

The breccias of the quartz particles are relatively large. The diameter of the particles is 4-5 mm. The exterior is shaped like a flame or a torn piece of cloth. The edges all have brown-colored patterns of iron oxides on them.

The diameter of particles of devitrified quartz breccia is smaller, about .2-2 mm long. It presents an elongated appearance, with a flattened lens or spindle shape. In some of the literature shapes of this type are termed aerodynamic. Judging from the factors that contributed to its formation it was originally most likely a kind of silicate-glass ball. But today, it has already been devitrified and become an aggregate of many particles of allothimorphic quartz. In the interior of some breccia, microcosmic particles of black metals have clumped together to form a lump. As for the spherical particles, they are traces of the original glass there. On the edges of these breccia, brown-colored patterns may often be seen. Very few breccia have an edge forming a circle of quenched iron oxide. Within the pattern bits of brown molded glass with a serpentine shape can still be seen sometimes. This glass still contains air holes and spherical particles of metal. The particles within the edge pattern have already been pressed and elongated, melted and clearly arranged directionally, forming the flowing pattern. These phenomena show: In the process of forming impact breccia rocks, the rocks went through a process involving pressure, stress and heat.

The granite at the bottom of the crater has been pulverized and is made up of crushed stones, but the binding of this rock is very tight and still retains its massive form. Some demorphs of feldspar have been twisted and broken, their mica bands deformed, especially the very many quartz particles which have already been melted. In some of the quartz particles micro-lamellae have already been produced. This kind of rock is very likely the authigenic breccia produced by the process of impact.

Judging on the basis of the relatively well-preserved condition of the rim, this crater was probably formed during the Cenozoic period.

From the diameter of the crater, the meteorite's diameter was calculated. The meteorite that formed the crater was either an iron meteorite 75 m in diameter or a stone meteorite 100 m in diameter.

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VIEWS ON MEDICAL EDUCATION REFORM PRESENTED

Beijing SHENGLI KEXUE JINZHAN /PROGRESS IN PHYSIOLOGICAL SCIENCES/ in Chinese No 3, 25 Jul 84 pp 283-285

/Article by Lin Kechun /2651 0344 2797/: "Some Views on Reforming Current Medical Education"/

Comrade Deng Xiaoping wrote an inscription for the Jingshen School: Education must face modernization, face the world and face the future. Medical education is certainly not an exception to this goal. This inscription starts out from a strategic height, and the requirements it sets on education work should also be the direction for our comrades in the medical educational work.

In the 30 some years since the Liberation, our educational field has made great strides, whether quantitatively or qualitatively, there are much improvements over the past, and the achievements are quite distinctive. At the same time, from our position as a big country, even though in the development of modern medical field we have trained a younger generation which has made outstanding achievements, or the internationally recognized contributions, such number is still not great, and this is very unbalanced. This is intimately related to our whole educational system and the entire training methods and teaching field. Comrade Deng Xiaoping's inscription has given us a great inspiration, and at the same time, it has given certain pressure to our comrades who have worked in education field for a long time. Can the people of our generation conscientiously think about and thoroughly analyze the three challenges in the inscription, to come up with a set of suitable methods to meet them progressively? This is our unshirkable duty. Here it involves many problems and requires common discussion of the mass of teachers. I am only offering some preliminary views on the emphasis of the foundations of medicine.

I

In order for medicine to satisfy the requirements of the "four modernizations" and to make contributions to the future and to the world's medical science, we must first have certain understanding of the development of modern medical science. Medicine belongs to the

scope of biology, and modern biology is in an important period of tremendous transformation that began in the middle of this century, and its mark is in the development of molecular biology. This is due to the theory and technological development of physics, especially it began with the determination of the spatial structure of DNA macromolecule by X-ray diffraction. In the next 30 years (from the mid-20th century on), the understanding of life process has penetrated the molecular level, and it has brought along a large n mber of disciplines deep into this level. Genetics is the first one affected by this: From the research on fruit fly and pea, it enters into the basic sequence of DNA double helix, coupling with research of the expression and mutation mechanism of gene, the molecular genetics is formed. Pharmacology has penetrated the relationship of molecular structure of drugs, conformation, and curative effect, and the research of the mutual effect of drugs and the receptors have led to molecular pharmacology, even to quantum pharmacology. In the last 2 centuries, pathology has undergone affection from organ, tissue, then cell, and even currently to the molecule level, thus the so-called molecular pathology appeared. Others include systematics, physiology, immunology, biochemistry, even to hygiene, etc. all have the same trend.

From the technical point of view, many new technologies have appeared in the 20th century. These include light and wave spectra, laser, supersonics, radioactivity and stable nuclide, and fundamental particles and electronic computer technology, each of them takes medicine as its important application, without exception, but it is gradually changing the aspects of medical research and clinical applications. In the past, physicians could get by without much contact with physics and its techniques, but now only is it unavoidable but one will gradually become incapable of adapting, much less talking about development. I remember that 20 years ago, I had emphasized the importance of nuclear magnetic resonance techniques. Many people then had never heard of that term, apparently it did not attract the attention of the health department. Now, nuclear magnetic technique has become a popular topic of world-wide attention. This is because people have always been, for a long time, hoping to have some kind of methods to spy out the affection and its metabolism inside the body under biopsy, and nuclear magnetic imaging just happens to have better resolution for soft tissues. Consequently, it has more ideal discrimination for the greyish substance of the brain tissue, thereby supplying the clinical diagnosis with useful information. Also, changes in the condition of the internal metabolism will cause difference in the images received. Therefore, it cannot only supply anatomical pictures but also the biochemical pictures. Due to its having almost no clear damageing effects on the organism, therefore, it is superior than the laminagraphs of X-ray. These situations show, whether on the theoretical or practical aspects, that modern medicine has put new requirements on physicians. Suppose we link this to the tide of the so-called yet another technological revolution that everyone is talking about, that is the innovation centered around microcomputer applications, and the

medical field is also one of its important territories. An experienced physician can use a computer to store the information of his rich experience of diagnosis and treatment, and this kind of information can be within the easy grasp of the younger generation. What we speak of here is not a wish to be realized decades later but it is already a current fact.

Faced with the above fact, how should medical education be adapted? Leaving it intact will only cause it to get a beating, but neither will patching up, increasing curriculum, and extending the schooling time solve the problems, let alone the accumulation of knowledge that is currently termed as being explosive, these kind of methods is a bottomless pit. This then forces us to have to consider the characteristics of these knowledge and their interrelation, from which to come up with a new educational plan.

The characteristics of current scientific knowledge are: (1) there are much overlappings among the disciplines, so it is impossible to obstinately cling to one's own past little world and not to understand the development of its discipline; and (2) each discipline is undergoing, with varying degrees, different renewal and reorganization; for example, the department of anatomy in many American schools has been renamed the department of anatomical and neurological sciences, the department of physiology is being renamed physiology and biophysics department, biochemistry department is renamed molecular biology or biochemistry and biophysic department, etc. The "modernization" of each discipline has a common foundation, and molecular biology and cytology form this very important foundation. Here, our students began to hear about the structure of DNA double helix in high school biology class, then they hear again about it in medical school in biology, histology, physiology, biochemistry, and immunology classes, altogether having heard about it at least five times, but each time at about the same level. Moreover, the recent views of liquid mosaic theory of biomembrane is also like that. The audience can only catch a few sentences in the summary, and the speakers are lacking self-confidence in presentations. This is the result of long-term neglect to emphasize mathematics and sciences and biophysics and technologies. Therefore, I feel that plan for medical education should also have a larger reform. It should strengthen mathematics and sciences, it should increase curriculum relating to molecular biology and cytology, and also the fundamental knowledge of electronic computer. It should resolutely eleminate out-of-date contents of each subject, and it greatly diminish the classes which spend much time in narration. If the foundation is well, it may be easy to get a good grasp of the contents itself. If the foundation is incomplete, each new problem must be learned from the beginning, it may be hard to absorb as one gets older.

Planning is only one aspect of the reform, and more importantly, is how to train the kind of talent that will be capable of independent learning, independent thinking, and independently solving problems. There are more discussion on the relationship of the knowledge accumulation and exploration of intelligence. University is certainly different from secondary and elementary schools, not only displaying more specialization, but university contain the "three independent" type of students. Therefore, a college instructor's duty is to help the students so that they can graduate into a kind of learning without teachers; in other words, the effect of a teacher is used to do away with the need of a teacher.

In our universities, the phenomenon of note-taking and note-memorizing is getting more and more serious. One feels that this is not right in theory, but in practice it is hard to change. This is inseparable from the obstacles of the teacher's experience and way of thinking, and this also says that the force of habit is still very stubborn. Ordinarily, I do not consider myself to be most conservative, but after having looked at the situations while abroad, several cases have caused me to feel that the severity of the problems far exceed my estimate. I have attended lectures by several professors. One professor lectured on biophysical chemistry; of the 30 sessions he lectured 10 sessions, talking to and questioning the students, and having discussion freely with them during the lecture, and the remaining 20 sessions were assigned to students for preparation, with pre-selected special topics. Of course, the teacher continued to have leading effects. Then, the students went up to lecture the class, in sequence. Afterward, the teacher and students had a questions and discussion period. In such a fashion, each student had to rely on himself to learn. In another example, a "star student" went to America to study for a degree, and, in half a year he had experienced much. He said that the lecture only talked in the classroom about the most fundamental and most recent development, one had to read about the specific contents by oneself, but the examination would cover everything, thus one had to read the various reference material. One had to look for various ways to solve some difficult problems, and in the end the method might not be useful. However, as one understood more ways to solve the same kind of problems, one became more agile in learning, but sighed with feeling that those in China would have a hard time competing against them. Certainly, this cannot be said in such absolute way, but our current fault is in knowing only in stuffing the student with knowledge, but not looking into developing his intelligence. The point will show itself in actual work years later. If this problem is not thoroughly solved, the severity of the consequences can be imagined.

Here, we must first touch upon the number of courses and their lengths. Actually, this is intimately related to the method of lecture. The

same engineering specialty basic course--the Fundamentals of Electrical Engineering--consumes up to 120 classroom hours in China and only 40 hours in Great Britain, I discovered this from the discussion between two engineering students. The one who went to school in England was greatly surprised, saying that there is never such a course in England with that many classroom hours. While I was in America, I asked a physics student how many fundamental courses did she have in biology? She said two, one in biology and one in biochemistry (molecular biology). Looking back at the students in the 60-year specialty system in our schools, the number of biology courses they took almost equaled to those taken by medical students. Such great disparity cannot be separated by our old way of thinking. We always feel that we can only learn if we talk about the subject, and the subject will appear to be important if we learn it. We always feel that medical school is different from the science and engineering school, that one preparing to become a doctor must learn almost everything. Such thinking is worthy of suspicion.

I have a preliminary idea, can each examination be handed out to students at the beginning of the term? The students considered capable of self-learning may be allowed to skip classes. The teachers will help them when they have problems, and then they discuss the difficulty. In any case, the weekly classtime should not exceed 20 hours. Let the students have enough time to have self-learning discussion under the guidance of a teacher. Change the non-mandatory courses to electives. Let the students use the time saved to listen to more reports on new development by experts, to participate more on physical training, to have more contact with society, to gain some knowledge in the arts, and to participate in individual music and arts activities.

Certainly, doing things this way still requires us to simultaneously solve a whole array of problems. For example, in order to have a very good learning environment, especially having a library, and it requires a very convenient duplicating machine to allow one to have access to reference material; laboratories should be more accessible, letting the students have the opportunities to independently carry out their experiments. Another especially important thing is the problem of knowledge renewal of the teachers. The teachers need to re-learn, especially gaining the knowledge and techniques of modern biology, In every few years, there should be certain time set aside for advanced studies and research. In the modern time of very rapid knowledge renewal, it should be done in this way. In developing scientific research, let the teachers gain further knowledge in areas of research and only then can their lectures become vivid and lively. There are certain difficulties in carrying out these ideas, and these difficulties cannot be solved right away. However, if everyone from the leadership to the teacher, then to the staff realizes its necessity,

realizes the success of reform relies on being carried out, realizes its strategic significance of our country's "four modernizations" and everyone positively acts on this reform, then the development will be accelerated.

These ideas of mine may not necessarily be correct, and if they can raise some argument such that we can move a step forward in understanding the direction suggested by Comrade Deng Xiaoping, then they may have some effects.

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brigades of Mentougou area. As is estimated, the annual fell of Beijing area is about 400,000 cubic meters. Another factor of forest damage is caused by fires resulting from improper care of forests. In the spring of 1981, Yanqing County had three consecutive forest fires within 6 days which affected over 800 mu of forest and over 16,000 trees.

Damaging forests is easier than afforestation. Presently, Beijing still has 6.50 million mu of waste land suitable for afforestation. Calculated at our afforestation capability and speed in recent years, it will take 25-30 years to completely afforestate this waste land. However, considering the forest area surviving from 30 years of afforestation since the establishment of the country, it will take over 240 years to fully cover this land with trees.

II. Little Forested Acreage in the Capital Suburbs

The forestation area of a city's suburbs is an important indicator of its ecological environment. The high-density population and buildings of suburban area result in serious industrial and domestic pollution. Green plants, especially trees have a tremendous effect on this kind of environment. They can purify the air, eliminate noises, block up the dusts and beautify the environment. After a day of hard work, people need a place with fresh air, and nice and quiet environment to relax, to adjust their state of mind and to get refreshed. Parks and green areas are indispensable to city residents. Gardens have always been valued very highly in our history. We have very high level of horticulture. According to the records in "Chen Yuan Zhi Lue" [Annals of Imperial Cities], Beijing had 400 or 500 parks, temples, historical sites and scenic spots. The pavilions, halls and the like of these parks and temples were usually surrounded by trees, flowers and grasses, rivers and lakes and mountains and rocks. However, due to the destruction of wars and neglect and reconstruction, in the early post-liberation period, there were very few parks left in the city. Even the 12 places which could be called parks were mostly old altars, temples, palaces and gardens. After liberation, with expansion and extension, the number of public parks increased to over 61 places, an area of about 47,000 mu and 20 million trees by the beginning of the 1960's. However, about one-sixth of the area was seized, half of the trees cut and some of the ponds filled up during the 10 years of turmoil. By the end of the 1970's, suburban Beijing had 64 public parks, an area of about 40,000 mu, 5.07 square meters per person. If the area of water is not included, however, each person has only 3.9 square meters. The parks take up only 22.3 percent of the city area. Such little area is not very useful in a city like Beijing where there is a lot of human activities. It is even less useful in purifying air, blocking noises, wind, sand, dust and the like.

III. Too Much Land Reclamation and Soil Erosion

The continuous increase in population in the Beijing area makes the demand in agricultural products higher and higher. Most of the cultivatable land there has been cultivated. Even some of the hills have been transformed into farmland. Many different natural ecological environments have been replaced by farmland. As a result of the great decrease in grassland, livestock such as cows and sheep

are forced to graze on relatively steep hills. The damages done to natural vegetation by over grazing results in serious soil erosion. After many years of control, the over 6,000 square kilometers of land with serious soil erosion in Beijing's mountain areas decreased to about 3,000 square kilometers. In mountain areas, there is still 470,000 mu hillside farmland which loses soil during heavy rainstorms.

IV. The Decrease in the Water Table and Insufficient Water Resources

The population growth and industrial and agricultural development in Beijing demands more and more water resources. Miyuan and Guanting Reservoirs are Beijing's chief surface water resource. For many years, the average rainfall of Beijing has been about over 600 mm, annual rainfall about 10 billion cubic meters. However, 70 percent of this is lost due to uneven rainfall and evaporation. Excluding the part seeping into the ground, very little water is left to be stored and used. Adding the water that comes from outside areas, Beijing has a total of about 4.5 billion cubic meters of surface water. However, only 2.4 billion cubic meters is stored by the water conservancy facilities and can be used. The average water that Beijing gets from underground resources for many years is 3 billion cubic meters annually. The amount of water demanded by industry, agriculture and people is about 4.7 billion cubic meters every year. Calculated from theories and quantities, the current demand and supply of water is basically balanced, but not much is left over. However, calculated at the developmental speed of industry and agriculture and the improvement in people's living standard, Beijing is an area with badly insufficient water. In fact Beijing has more drought years than it has years with plentiful rainfall. It has experienced the insufficience of water long before, especially in drought years when there is very little rain, and when water is used massively and carelessly. Take the underground water resource in the city area for example. The city waterworks extract about 900 million cubic meters underground water each year, yet only 600 million cubic meters is supplied, over extracting 300 million cubic meters. As a result, the groundwater level declines year after year, averaging about .5-1 meter each year. Many large funnel-shaped areas have appeared.

V. Windy, Dusty Winters and Springs

Beijing area has a temperate monsoon climate. In the summer the southeasterly and southerly winds predominate; in the winter it is chiefly the north-westerly and northerly winds which predominate. The average annual wind speed is 2.5-3 m/second in most areas. Flat areas, especially at wind gaps, have a higher average wind speed. Most areas have over 20 days when the wind speed reaches over 17 m/second. Of these, Yanqing and other places have as many as 50 days. Gale happens mostly in winter and spring. The highest speed ever is 40 m/second. Due to these climatic characteristics, plus the serious vegetation damage which causes soil exposure, and the relatively dry weather in the winter and spring, Beijing has relatively serious wind and sand problems. When gales blow, they blow sand all over the earth and dust and dirt dancing all around in the air, whirling dust and sandstorm weather is usually formed. There has been 20 days of sandstorm weather at most in a year. As many as 71 sand-cloud days with a level of visibility equal to or less than 6 km can occur in a dusty year.

According to calculation, April, a windy month, is the month which has the most dust. In Beijing city area, the average dustfall in April has reached 83.5 ton/square km. Even Shisanling which has relatively good vegetation environment, has an average of about 20 tons/square km dustfall in April. Due to topographical factors, a wind and sand jeopardized area exists along the banks of Beijing's Yungdinghe and Chaobaihe, and between Yanqihe and Baihe and Nankou and Kangzhuang where 1.1 million mu farmland is affected.

VI. Frequent Drought and Waterlogging Hazards

Due to the lack of forest cover to promote the regulation and circulation of water, the annual precipitation is very uneven in Beijing area. It can be as much as over 1,000 mm a year and as little as over 200 mm. The seasonal distribution of rain is also very uneven. Rainstorms appear mostly in the summer. The rain of July and August makes up over 60 percent of the entire year's rain. The highest daily precipitation ever recorded is 479 mm. The average precipitation in winter and spring, especially winter, is less than 60 mm. The most serious drought recorded lasted 120 days. When a drought happens the surface and underground water resources usually become insufficient which affects industrial and agricultural production as well as domestic water. Over concentration of rain means rainstorms which will increase the surface runoff and result in the loss of water and soil. Rainstorms can also hold up traffic, bringing losses to production and inconveniencing people.

Besides, Beijing area has a lot of other hazardous weather such as hail, thunderstorms, cold waves, frost and the like which cause a certain degree of losses to production and people's life.

VII. Decreasing Wild Faunae and Wild Flora Resources

Wild faunae and wild flora are an important part of the natural ecological environment as well as important natural resources. Besides their value in economic production, scientific studies, teaching and experiments and the like, they play an important part in keeping the natural ecology balanced. According to incomplete calculations, Beijing area has about over 400 kinds of vertebrates, over 1,500 kinds of insects and over 950 kinds of vascular plants. However, the population of wild faunae and wild flora has decreased greatly as a result of the long-term hunting and collection. Some species are endangered. As is recorded in literature, Beijing area used to have large animals such as river deer, musks, muntjacs, tigers, bears, etc., but they no longer exist here. Wild boards, the Asiatic chamois, leopards, roe deers, etc., are hardly ever seen. Another reason for the decrease in wild faunae and wild flora is the damages done to wild faunae's habitat and wild flora's living environment, plus environmental pollution and disturbances from human activities.

VIII. Rampant Plant Diseases and Insect Pests Harm Crops

Large quantities of agricultural chemicals have been used to control plant diseases and insect pests. As a consequence, a lot of the natural enemies of harmful insects are killed by chemicals together with destructive insects. The more chemicals are used, the more varieties of destructive insects appear. According to study, most of the birds in the natural world are beneficial birds.

They live mainly on insects. One of the reasons that destructive insects become so rampant is the decrease in bird population due to pollution and hunting. Besides, the capturing of frogs and dragonflies are also to the destructive insects' advantage.

As a result of the reasons described above, Beijing city has suffered from serious plant diseases and insect pests. The damaged area for grain crops alone reaches about 10 million mu each year. Though the plant protection departments have adopted many kinds of preventive measures, still about 200-300 million jin of grain is lost each year. According to incomplete statistics, there are about 150 kinds of plant diseases and insect pests that frequently bother fruit trees and forests.

IX. Decreases in Good Farmland and Soil Fertility

Due to population growth, industrial development, the continuous expansion of city area and suburban counties (districts) and towns, a lot of Beijing's farmland is being taken away for the construction of houses. In the last 30 years, Beijing lost about 1.6 million mu of farmland which is about the size of Baiding area and Shijingshan area together. At the near suburban area there was some old vegetable farm whose high soil mellowness, good structure and thick humus-rich soil used to produce over 10,000 jin/mu vegetables. It is a great shame that this was taken away for construction sites.

Lately, a large quantity of chemical fertilizer has been used in an effort to improve the production. Most of the fertilizer used is nitrogenous fertilizer, a very small amount of .. is phosphate fertilizer, but there is hardly any potash fertilizer used. Organic fertilizer is used only in very small amount and is of very low quality. As a result, the soil structure is damaged, the content of organic substances and the soil fertility decreases. It is calculated that the organic substance content of most of Beijing's farmland is below 1 percent.

Soil pollution is one of the chief factors that cause soil deterioration. Beijing city discards about over 1.5 million tons garbage every year. Although part of the garbage is organic substance, most of it is coal ash, slag, bricks, broken tiles and the like. After "fermentation" at the dump, the garbage is used as "fertilizer" in the farmland. According to a research carried out in a vegetable plot of one of Fengtai area's production brigades, the surface of the soil is covered all with slags. It was analyzed that out of approximately 2,000 jin/mu substance, only 3.6 percent was peanut skin, kaoliang roots, vegetable leaves and the like. Over half of it was slags and coal cinder whose circumference was over 1/2 cm. Calculated at two applications, over 2,000 kg of harmful substance enter the soil each year.

X. Saline-Alkali Land

According to the 1961 data, it is calculated that Beijing has about 200,000 mu saline-alkali land in its low-lying and flood-prone areas. In recent years, saline-alkali land has been reduced a little through the ... water table and the planting of paddy. It is estimated that there is still ... mu ...

saline-alkali land to be transformed and used. Most of Beijing's saline-alkali land is concentrated in the south and southeast part of the plain area. It is one of the important tasks of transforming Beijing's natural ecological environment.

What kind of measures should be taken to tackle the series of problems existing in Beijing's ecological environment?

To begin with, we should increase the percentage of forest cover and expand the forested area in the city by conscientious afforestation. Special attention has to be paid to the planting of windbreaks and sand-fixation forest, farmland protection forest, water and soil conservation forest and water-head conservation forest. We should set up some natural protection area so as to protect the wild faunae and wild flora resources.

Under the premises of protecting natural environment and natural resources, we should rationally arrange the plans of municipal construction and economic development. Special attention has to be paid in order that our activities and behaviors tally with natural laws and long-term benefits.

We should establish a good agricultural ecological environment in accordance with local conditions. We must improve the soil, transform the saline-alkali land, apply fertilizer rationally, strengthen the technological management of agriculture. Protect the natural enemies of harmful insects, investigate the use of biological control of plant diseases and insect pests and reduce the use of agricultural chemicals to the minimum.

We should strengthen the pollution prevention as well as environmental management work and work hard to improve the environmental quality. We should elaborate laws relating to natural protection in order to guarantee the rational use of natural resources and put an end to all natural-resource-damaging activities and phenomena.

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ENVIRONMENTAL QUALITY

CITIES MOVE TO CONTROL NOISE POLLUTION PROBLEM

HK070654 Beijing CHINA DAILY in English 7 Nov 84 p 3

[By staff reporter]

[Text] Things have quietened down in Changsha, the capital of Hunan Province, following imposition of noise control regulations last Thursday.

Loudspeakers to attract customers have been removed from store fronts and tweeters are banned in urban areas.

The regulations cover traffic and industrial noise as well as loud social activities, city officials said.

Televisions, recorders and radios must be turned down at night. Fines range from five to 500 yuan. In serious cases, the offending machine may be confiscated.

The pounding of drums and the lighting of firecrackers are also prohibited in the evening, according to the new regulations.

Downtown traffic noise has dropped six decibles since last Thursday as the tooting of horns has been stopped in three main streets. There are six stations checking horns and motor vehicle noise.

City authorities said that nine residents' groups have been set up to monitor more than 100 noisy factories and workshops that have been ordered to muffle or remove their machinery.

The city's efforts to control noise pollution are part of a national drive to curb traffic and environmental noise pollution.

A draft law controlling environmental noise went into effect earlier this year.

In Beijing, the average traffic noise has been reduced from 69 decibles in 1979 to 67 decibles, although the number of motor vehicles in the city has increased from 110,000 to 160,000.

All other major cities in China have adopted measures to tackle noise, but the problem is far from being solved.

Some cities still have noise that registers higher than 65 decibles.

According to experts, noise of more than 140 decibles can be lethal while a noise of 70 decibles can cause not only brain disorders but other physical harm.

China started to tackle pollution problems in 1973, but it had ignored noise until 1981.

Shanghai, Chengdu and Lanzhou top a list of 25 cities with above average noise levels. Other noisy spots include Beijing, Changsha, Tianjin, Nanjing, Xian and Fuzhou.

A recent survey of traffic and environmental noise in Beijing and Tianjin showed that noise pollution, although much alleviated, is still a serious problem. There were 670 lawsuits in Beijing and Tianjin complaining about noise pollution last year.

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WATER POLLUTION PREVENTION DISCUSSED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 7, 1984 pp 2-5, 11

[Article by Tao Baokai [7118 5508 2818], professor of Qinghua University: "On China's Water Pollution and Its Control"]

[Text] I. Acknowledging the Problems

The main problems we have is that we have not sufficiently acknowledged the complementary and dialectical unitary relationship among environmental protection, pollution prevention and economic development. That economic construction, environmental protection and pollution prevention should be deleloped in a coordinated way is a strategic problem. Since environmental pollution and the damage to ecological balance results from socioeconomic development, they can only be solved by further socioeconomic development. The development of economic construction will unavoidably result in pollution. We have ignored the complementary and dialectical unitary relationship between the environment and the economy if we pollute the environment first and seek management afterwards, or sacrifice environmental quality for economic development. This is an extreme deviation from the goal of socialist production. However, protecting the environment by restricting the economic development is not in accord with the laws of socioeconomic development. At the symposium held in Kunming in July 1983 analyzing China's current environmental quality and its trend, it was concluded: at the present stage, we should start from formulating environmental planning, municipal planning and water pollution prevention planning as the key economic development areas, and carry out the goal of economic development and environmental protection. At the same time we should also carry out the environmental, municipal and water pollution prevention planning within the system of national economic planning. We should also propose various environmental functional areas in environmental planning. For example: what is to be protected, indicators and the economic restraints on water resources by promoting the rational distribution of the regional economy, thereby achieving the best economic, environmental and social benefits. The leading cadres at different levels should pay close attention to both economic construction and environmental construction. To think that pollution prevention is not important at all or think that we can wait a while has become an obstacle to the economic construction. Soil erosion resulted from the damages done to plantation and the felling of forest; losses in agriculture, fishery and people's health resulted from the pollution of reservoirs; losses in agriculture resulted from soil pollution and acid rain.

These are some examples of the mutual influences between environmental and economic construction. Vice Premier Li Peng [2621 7720] said, "Construction in rural and urban areas as well as environmental construction should be planned, executed and developed synchronously so as to integrate the economic, social and environmental benefits." Therefore, it is very important to vigorously publicize the complementary relationship between economic construction and environmental construction, and to improve the knowledge leading cadres of different levels, especially the leading cadres of enterprises, have on this subject.

II. Views on the Comprehensive Treatment of Water Pollution

One of the very important reasons that water pollution is not solved in some areas of the country is the lack of attention paid to comprehensive treatment. For example, the water pollution of Shanghai's Suzhouhe has been discussed for several years, yet, the problem is not only still waiting to be solved, but it has extended to Huangpujiang. This is mainly because that while old problems have not been solved, new problems keep on emerging; that the old pollution sources and polluted areas are still waiting for treatment, new pollution source and polluted area continue to appear. Comprehensive treatment requires that the pollution sources of every river and polluted area be investigated thoroughly. What problems exist at the pollution sources, what pollutants are discharged and how can they be treated in order to retrieve or reuse pollutants? When treating sewage, what kind of treating techniques should be adopted and of the various treating plans, how should artificial treatment and natural purification be integrated? The main idea is to make sewage a resource. Is every pollution source arranged properly in regional planning? How can single treatment technique be integrated with regional prevention plans? How should environmental impact evaluations be integrated with city planning so as to achieve a comprehensive prevention plan. In carrying out comprehensive prevention plan, it requires that we do both small-scale and large-scale research and integrate small-scale with large-scale research, thereby achieving the best comprehensive prevention plan. Without a comprehensive plan, we will not be able to do the pollution prevention job well. We would be simply treating the symptoms but not the disease itself. A comprehensive water pollution prevention plan should also include a plan for a drainage pipeline. Questions such as how to drain industrial and enterprise waste water, how to plan for excrement and urine, the sewage, the rainwater, the main and intercepting sewer in a residential area, should be integrated with municipal or regional plans so as to achieve the best comprehensive prevention plan and leave it to the experts in environmental engineering, municipal engineering, water-supply and drainage engineering and municipal plans to finish it cooperatively. Apart from the technical aspects, research must also be done in order to develop economic, administrative and statutory measures for comprehensive prevention.

III. Good Environmental Impact Statements

In the "Environmental Protection Laws" issued in 1979, it is stipulated: "Enterprise and business units should pay close attention to the prevention of pollution and damage to the environment on selecting sites, designing, constructing and producing. A report stating the environmental impacts should be submitted

on carrying out construction, reconstruction and extension projects. Only when the report is examined and approved by environmental protection departments and other responsible departments, can a design be carried out." According to the above stipulation, the evaluation of environmental impacts is considered an essential factor on investigating the feasibility of a construction project by planning, economic and environmental administration departments. Each construction project is not only evaluated from the economic angle but also from the environmental protection angle. If a construction project has a favorable economic evaluation but will cause great damages to the ecological environment, this project needs further investigation. The comprehensive use of environmental impact evaluation system in economic development will result in rational distribution of economic development. The adoption of this development mode can avoid the "pollute first and treat later" road which the industrially advanced countries were once on and achieve economic development without damaging the environment.

An environment impact statement is principally concerned with:

1. A brief statement of the construction project. It includes the characteristics, scale, technological process and the ways and quantity of the harmful substance to be discharged.

2. Possible impacts on the surrounding environment, including the surface water, underground water, atmosphere, soil, plants and animals, etc., from the construction project.

3. Evaluation of the construction project's qualitative and quantitative impact on the environment and analyses of the economic gains and losses.

4. Proposing the best plan.

5. Proposing a possible substitution plan.

The major subject of the environmental impact statement at the feasibility study stage is to prove the construction project and predict the possible environmental impact. The environmental impact evaluation at the planning stage is tentative and rough. However, since it involves the rationality of distribution it is a key point.

The environmental impact statement on water pollution prevention at the planning stage covers main and intercepting sewer, whether to adopt a divergent or a confluent system, investigation of pollution sources, the treatment methods of industrial waste water and municipal sewage, final sewage escapement and the impact on the upper reaches as well as the lower reaches, etc. Comprehensive consideration of these questions can only be achieved on the experienced experts' meticulous analyses. In big cities, the job can be carried out in many regions on the condition that comprehensive studies be done on the environmental impact different regions and involved cities have on each other. This kind of environmental impact evaluation should be integrated with municipal plans, and, in turn, influences the municipal plans.

Besides the environmental impact evaluation for regional development plan and municipal development plan, environmental impact evaluation is also needed for single construction projects. In recent years, environmental impact evaluations have been carried out in large- and medium-scale construction projects such as metallurgy, petroleum, chemical engineering, electrical power, light textile industry and water conservancy, etc. To do the environmental impact evaluation of water pollution prevention well, close coordination is needed among environmental protection or environmental engineering, municipal planning, municipal engineering or water supply and drainage designing departments and project construction departments. The current lack of coordination and comprehensive plans in some departments should be overcome.

IV. Revising and Enlarging Water Quality Standards and Strengthening Environmental Administration

The water quality standards currently adopted in different places of our country are formulated by public health departments, by construction departments, or by local governments. The major contents are as follows (see National Environmental Protection Office: "Environmental Pollution and Control," 1981, pp 321-343, and Ministry of Urban and Rural Construction and Environmental Protection: "Collected Documents on National Environmental Protection Laws and Regulations" 1973-1983):

1. Standards of drinking water;
2. Standards of tap water quality;
3. Standards of irrigation water quality;
4. Standards of surface water's environmental quality;
5. Requirements on the hygiene of surface water and the allowable density of harmful substance in the surface water;
6. The allowable density of harmful substance in the surface water;
7. Standards of the water quality of fishery waters;
8. Standards of industrial waste water discharged

a) Allowable density of industrial waste water discharged. First category: applied to harmful substance that accumulates in the environment or in plants and has long-lasting effects on human health.

b) Allowable density of industrial waste water discharged. Second category: applied to the water quality at a factory's drainage opening which does not have harmful substance with as long-lasting effects as those in the first category.

9. Standards of seawater quality;

10. Regulations on radiation protection. Lately, the Ministry of Urban and Rural Construction and Environmental Protection issued 10 standards including discharge standards for the pollutants of ships and boats; discharge standards for the pollutants of the paper manufacturing industry; discharge standards for the pollutants of the canesugar industry; discharge standards for the pollutants of the synthetic fatty acid industry; discharge standards for the pollutants of the synthetic detergent industry; discharge standards for the pollutants of tannery industry; discharge standards for the pollutants of the petroleum refining

industry; and discharge standards for the pollutants of petroleum developing industry. Besides, "Norms for the Design of Outdoor Drainage" lists the regulations for the discharge of industrial waste water into the cities' sewers. To strengthen the management of the water environment, I believe that we should assign people from the Ministries of Public Health and Urban and Rural Construction and Environmental Protection to integrate our practice, revise and enlarge these standards and regulations immediately. This has a very significant meaning for our management of aquatic environments and prevention of water pollution. The confirmation of the environmental impact evaluation of water pollution and the best plan for water control also awaits the revision of the water quality standards.

The quality of management of water environment is a key to the protection of aquatic environments and the control of water pollution. We have to understand that water is a very important resource to begin with--as a living resource and as a production resource. People often think that water is a "free resource," thinking that it is inexhaustible and that the management of water resources does not have too much economic value. This kind of view does not conform to the facts in modernized production. We should improve popular understanding of the significance of water resource management in order to manage the environment well.

According to research, the reason that six of our nation's industries including chemical fertilizer and pharmaceutical are causing serious pollution is chiefly because that only one-third of the material put into production winds up in the final product. The other two-thirds is discharged as waste but causes serious pollution to the water body. To solve the water pollution problem, good management of production is indispensable.

Essential contents of technical reform of production include comprehensive utilization, retrieving useful material and multiple use of water. These are also important measures for the management of water environment. For example, the technical reform and reinforcement of management raises the repeated use of water in some factories from only about 30 percent to 80-85 percent. What these factories can achieve, other factories should be able to achieve, too. The protection of water resources and the transformation of waste water into harmless resources are subjects of water environment management deserving careful discussion.

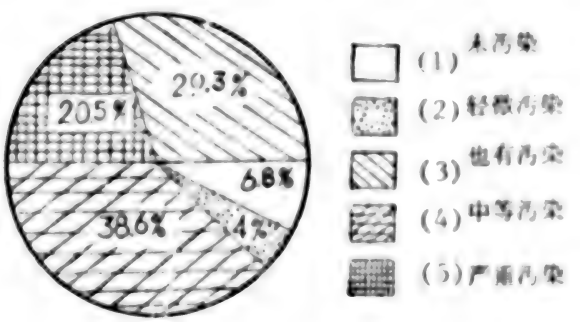
To manage our environment, we have to strengthen environmental legislation as well as concentrate ourselves on the study of our own situation. For example: the "Whoever causes pollution should control it" principle provides the responsibility of treatment. This was believed to be effective for a while in the past. However, the industrial enterprises will have to build a lot of sewage plants if the sewage they discharge has to reach the surface water standard or the discharge standard. This will be a lot of waste for the entire society. It is generally more economic to treat regular pollutants together than to have it done separately. Thus, industrial enterprises will have to treat only their harmful and toxic substances and leave the regular pollutants to the city sewage plants. But when industrial enterprises discharge their waste water into the cities' sewers the question of assessing costs is involved. Therefore, conscientious studies have to be carried out on the quality standard of industrial

waste water to be discharged into the city sewers and on the assessing of costs involved. The management of water environmental pollution is very complicated. It involves the comprehensive consideration of economic, environmental and social benefits. The important tasks of the management of water environment include the theoretical system, ways and means of managing the environment and the revision and enlargement of water quantity standards.

V. A Sense of Urgency Towards the Water Pollution Prevention

Water pollution has become very serious in our country. According to studies done in 44 cities, all the surface water has been polluted. Most of the pollutants are organic. Pollution from phenol, mercury, arsenic and chromium is also very common. Fifteen of the nation's 27 main rivers are seriously polluted. The average content of phenol in Shanxi Province's Fenhe reaches 0.467 mg/liter, 47 times over the surface water standard, 700 km of Songhuajiang is generally above the standard in its mercury content. Xiangjiang, Dayunhe, Dianchi River system and Shandong Province's Xiaoqinghe, etc., are all seriously polluted with the primary indicators a few times or scores of times over the standard. Changjiang, Huanghe, Zhujiang are also polluted on the parts that flow by industrial cities. The water of Suzhouhe, Shanghai has been darkened. The pollution has reached Huangpujiang.

About one-half of our country's cities use underground water as the source of their water supply. About one-third of the country's population drinks underground water. Of the 44 cities investigated, 41 have polluted underground water. Of these, Beijing, Xian, Shenyang, Taiyuan, Baotou, Jinzhou, Jilin and Changchun cities are more seriously polluted while 17 cities including Shanghai, Anshan, Shijiazhuang, Huhehaote, Wuhan and Nanjing are moderately polluted. The main pollutants are phenol, cyanogen, arsenic, and nitrogen; the secondary pollutants are chromium, mercury and sulfur. The general hardness of underground water in some northern cities is a lot higher than the standard. (see the brief chart for the 44 cities' underground water pollution condition)



Key:
1. Not polluted
2. Slightly polluted
3. Polluted
4. Moderately polluted
5. Seriously polluted

A brief chart of underground water pollution conditions in 44 cities.

Since water pollution affects the quality of soil and food, grain, oil, vegetables and livestock, etc., are also affected. Therefore, we should try our best to prevent pollution and improve the water environment. We should understand that when environmental protection and ecological damage is concerned, prevention is better than treatment, early treatment is better than late treatment. Conscientious prevention measures should be taken to reinforce the management of unpolluted or slightly polluted areas and waters. As for seriously polluted or moderately polluted areas and waters, comprehensive treatment, integrated with regional planning and regional prevention, should be carried out. In a word, we have to have a sense of urgency towards the prevention of water pollution. For capital construction, we should insist on "three spontaneities." Comrade Chen Yun [7115 0061] pointed out: "We should pay attention to environmental protection. Money has to be spent on it." For some comrades, municipal construction is just building houses, building roads, erecting tall buildings, and building bridges. In other words, they consider only superficial things or things that they can easily see in the city. Certainly these constructions are necessary and there is still a lot to be done and strengthened to satisfy people's needs. However, in most cities, people think that there is no rush to take care of the river bed, laying the pipes, managing the underground water, controlling the industrial waste water and daily sewage, that we can put them off and that there is no time to construct them. When inspecting sanitation, people usually see only superficial problems and rarely see more practical problems, not to speak of the problems under the ground. We should understand that by preventing water pollution, we cannot only improve the environment and the public health, but also transform wastes into treasures and resources.

For the prevention of water pollution, we should put our national conditions into consideration and find out less expensive and more effective ways. For example, in many places of our country, we have already had some very good experiences in the recycling of industrial waste water, the land treatment of sewage, oxidation pond, sludge and the methanation and use of solid wastes. We should encourage scientific studies of water pollution prevention and put the results into practice. However, we should also understand that our country is relatively poor and that to control pollution and protect the ecological balance besides proper policies and management, a large investment is also needed. Therefore, for some cities' sewage, the general use of first class treatment and sludge digestion methods can be considered. Later on, second class treatment can be adopted according to practical conditions. In some places, more thorough treating methods might be needed. In this case, we should try to make the most use of the purification ability of water and soil while investigating, planning and designing. We should also integrate the practical conditions of different places in our country and search for the repeated and multiple use of water. At the same time as this, we should discover Chinese ways of pooling resources and prevention. In short, we should feel the pressing need of preventing water pollution. We cannot wait any more.

To achieve these, I think the cooperation and coordination between the environmental protection and municipal departments, between scientific research and designing and production departments that we have in our country needs to be

strengthened. We have to depend on the designing and work of civil engineering to prevent water pollution, to do the environmental impact evaluation and preliminary evaluation well, and to carry out systematic analyses and regional planning. We believe that the improvement of the pipe system, pump stations, water treatment plants, water pumps or the improvement of regional plans all require the close coordination between civil engineering workers and environmental science workers. Only thus, can we do water pollution prevention well. Currently, communication between organizations is not very good in our area. If we can, by academic exchanges, task cooperation and the like, strengthen communication and seek some changes, it should give a great impetus to our work.

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IMPROVING MANAGEMENT OF TOXIC WASTE STRESSED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 7, 1984 pp 8-11

[Article by Shi Qing [4258 7230]: "Management of Toxic Wastes"]

[Text] The management of toxic waste is the responsibility of the solid waste environmental management departments. Toxic wastes include: poisonous, inflammable, corrosive, reflexible, radioactive and infectious solid, semi-solid and liquid (waste water not included) wastes. (Examples are: rubbles, tailings, waste residue, bug dust, sludge, sweeps, slop, spend liquor and the like) If dumped carelessly or handled improperly, these wastes will not only cause inflammation, fires and relatively noticeable pollution such as water and atmospheric pollution, but also will affect the soil and underground water quality and result in ever-lasting and incurable serious problems. This is why it is acknowledged as a serious environmental problem throughout the world.

I. Lessons Drawn From Others' Mistakes

In the 1950's, our nation's Jinzhou Ferroalloy Plant stacked some chromium dregs. It was found, a few years later, that the water within over 70 square li was polluted by six-valence chromium and 7 of Zirantun's 1,800 wells could not be used. For this reason, the factory invested 650,000 yuan to build some water supply projects for the peasants in the area and 3.6 million yuan to build brick-manufacturing workshop. However, the bricks manufactured still contained six-valence chromium and could not be used regularly. Finally they spent another 4.6 million yuan to make an over 10 meters deep seepage-preventing wall around the chromium slag pile. The base of the wall went as far down as the underground rock stratum and thus the chromium slag was, comparatively, firmly surrounded. Yanshan General Petrochemical Plant's Xiangyang Chemical Plant drained a small amount of ethane into the sewer while overhauling its equipment. The ethane which followed the water into the cable well and later into the distribution room caused a fire and burned the 40-square meter distribution room to the ground. Over 4,700 yuan was lost and 3 staff members and workers suffered from burns. In the 1960's, the arsenic-carrying soot discharged by a mine in the antimony smelting process was stacked up in the open air for a long time. The soot seeped into a well with rainwater. As a result, 398 people were poisoned, 6 were killed and the well had to be closed off at the end. Nationwide, about 500 tons arsenic, 500 tons cadmium and 50 tons mercury a year disappear along with wastes in the

smelting of nonferrous metal. Besides, paints, coatings, rubber, plastics, batteries, pharmaceutical, agricultural chemicals, solvents, oil, tar products, etc., which are internationally determined to be toxic are mixed with solid wastes and water without our knowledge of it and become present or potential hazards to the environment.

II. Environmental Management of Toxic Waste

Currently, our country is formulating standards and legislation relating to the environmental management of toxic waste. Here are some suggestions with reference to foreign experiences for the investigation of pollution source, the filing and preparation for comprehensive management before the official issue of the standards and legislation:

I. Definition and Appraisal

Toxic wastes main wastes which can cause or result in death or increase diseases, which, when managed improperly, can become present or potential hazards to the health of human beings or the environment. Various toxicities and appraisal methods are as listed below.

The Reference Chart of Definitions and Appraisal of Various Toxic Waste

No.	Toxicities and Suggestions	Appraisal Value
1	Flammability: substance whose flash-point is lower than a certain value; or which has the tendency to ignite with friction, moisture absorption, spontaneous chemical changes; or which will generate heat during the processing, manufacturing process, or which will burn vigorously and continuously when lighted and cause danger during the management period.	USA ASTM code, flash-point lower than 60°C
2	Corrosiveness: wastes which when touched will cause visible damages or incurable changes to the tissue, skin; or which will cause qualitative changes to substances or leakage to containers which come into contact.	Liquids with pH $\geq$ 12.5 or $\leq$ 2; whose corrosive rate of steel products exceeds 0.64 mm/yr under 55.7°C
3	Reflexibility: unstable at standard conditions, causes violent chemical reactions very easily; acts violently with water, or forms an explosive mixture or produces toxic gas, offensive smell; contains chloride or sulphide; causes explosive reactions even under normal atmospheric pressure and temperature, explodes when heated or when placed in air catalyst; has instability with heat or environmental impact.	

No.	Toxicities and Suggestions	Appraisal Value
4	Radioactivity: wastes which can release rays with nuclear collision, whose radio isotope exceeds the maximum density.	Radium 226 (Ra226) density equal to or higher than 10 micro curie/ 1 gram waste.
5	Soaking Toxicity: any of the pollutants extracted through fixed soaking or extracting methods which exceed provided standard values. Pollutants include: cadmium, mercury, arsenic, lead, chromium, selenium, silver, benzene hexachloride, methyl chloride, toxaphene 2,4 -D and 2,4,5 -T, etc.	100 times over the drinking water with the USA EPA/EP experiment method.
6	Acute Toxicity: toxic wastes which when using one dose to animals for experiment has smaller lethal dose/50 (LD50) than provided value.	USA National Security and Sanitation Research Department's method: oral toxicity LD 50 $\leq$ 50mg/kg body weight, inhale toxicity LD50 $\leq$ 2mg/1, skin toxicity absorption LD50 $\leq$ 200mg/kg body weight
7	Aquatic Organism Toxicity: when using fish for experiment, the density value (TLm96) is smaller than provided value.	TLm 1000 PPm (96 hrs)
8	Plant Toxicity:	Semi-suppression density TLm50 1000 mg/1
9	Biological Accumulation: the enrichment of an element or chemical compound in an organism exceeds the environmental water, and shows positive when tested.	Positive
10	Hereditary Variation: the molecular changes in the DNA or RNA of mitotic or meiotic cells caused by poisonous substance result in serious carcigenic, mutagenic and teratogenic effects.	Positive
11	Irritation: cause dermatitis.	Cause dermatitis $\geq$ 8 degrees

2. Listing and Filing

The determination of toxic waste should be done through appraisal and experiments. However, it is a very complicated procedure and many factories and networks have difficulties carrying it out. Therefore, many countries make lists of toxic wastes according to accumulated experiences and issue them through legislative procedure so that producers, operators and environmental controllers and other related departments can keep informed. Up to now, the United States has determined 96 types of industrial wastes, West Germany 570 types, Denmark 51 types. The lists will be continuously revised and enlarged to keep pace with technological development. For units which are equipped to carry out actual examinations and appraisal, or when there are questions and need to be determined, the methods provided in technical standards should be used for appraisal and determination.

3. Codes and Standards

National as well as local environmental protection bureaus should both formulate codes (usually included in the codes of solid wastes) which cover: technical standards for toxic substance, the handling, storage, transportation, management, etc. The codes are to keep producers, operators and controllers informed and to allow the public to inspect and execute them. Generally speaking, the requirements of technical standards for new and old enterprises should be different.

As the first step to the environmental management of toxic waste, our country is currently formulating pollution control standards for agricultural waste residue, sludge; construction waste residue; nonferrous metal solid wastes and chromium dregs.

Transportation is an important link in the environmental management of toxic waste. Safe transportation should be guaranteed. So far, our transportation departments have regulations for over 6,000 types of harmful substance. However, the transportation link of toxic wastes is still a weak point. It is urgently required that environmental and transportation departments collaborate to formulate standards or regulations for toxic waste.

4. Collection, Handling, Storage, Transportation and Disposal

Determined toxic wastes should be packed, marked according to standards and rules provided. The quantities, quality, the amount of harmful content, the whereabouts, and things to be marked "caution" during handling, transportation and the storage disposal process should be indicated on a card (called routing in West Germany--a tag system) so as to enable the safe transportation of wastes from the point of origin to the disposal factory and where they can be disposed of harmlessly.

Giving a definite, distinct indication of harmful wastes is a link in the specialized management of the wastes. In the International GB. 190 - 73, our country has stipulated the toxicity, corrosiveness and inflammability signs as follows.

The package designs for some of the dangerous substance in our country:

o deadly poisonous substance (black ink on white paper)

oo corrosive substance (black ink on white paper)

o
oo corrosive substance (black ink on white paper)

oo
oo inflammable substance (pure red ink on white paper)

Harmful wastes should never be discharged into sewers or mixed with regular wastes. Different packing, storage and transportation containers and tools should be used for wastes of different natures. The international experience in special management of harmful wastes should also enlighten us on the control of water pollution and solution of waste water problems. To mix harmful wastes with solid wastes is a potential crisis for soil and underground water. This is an issue that we have to take into serious consideration in the future environmental management.

Pre-treatment of harmful wastes usually will reduce their treatment and management expenses. Examples: compacting loose wastes can reduce their volume: burning organic wastes can reduce their weight; compacting, dehydrating, filtering, pressing, demulsification, degreasing, etc., can reduce the costs of final treatment.

The ultimate aim of environmental management of harmful wastes is to give final treatment to the wastes to an innocuous state before discharging them into the environment. Innocuous treatment generally includes two categories: one of them is the control and management of pollution; the other is the development of comprehensive utilization of waste, making it become useful materials.

III. Disposal Methods for Harmful Wastes

When disposing harmful wastes, the environmental benefits should be ensured, also energies and materials should be retrieved as much as possible so as to achieve certain economic benefits. The disposal methods of wastes widely used throughout the world grouped according to their nature include:

1. Secure Land Fill Waste Disposal Method

This is a relatively easy method which can be widely used to dispose of many kinds of harmful wastes. This is also often the final disposal method for the final products of wastes after burning, solidification, biological or chemical processing.

Land fill dumps can be established on the land or in a valley. When selecting a land fill dump, detailed hydrogeological information should be first mastered so as to guarantee that the underground water is not polluted and that the disposal system is easy to manage. The dump should be made to be used as long as possible, and should be made in compliance with laws and regulations. When setting up a dump, the earthwork, investment and the like should be reduced to the minimum.

The seepage rate of the natural or artificial lining between the bottom of the dump and the substratum of the soil should be less than 10^{-8}mm/second; the position of the substance to be filled at the very bottom of the dump should be higher than the water table; the wastes dumped daily should be properly covered; discharge, collection, treatment and monitoring system should be set up for gas and liquids produced by the wastes dumped; rain and snow division equipment should be installed to keep them from seeping into the dumped wastes; when the wastes reach a designed height, the dump should be sealed up with clay and be rammed or made into a park.

2. Incineration Disposal Method

Incineration disposal method is appropriate for the disposal of organic wastes such as tar, petroleum, rubber, plastics and the like. Up to now, many different kinds of incinerators have been developed throughout the world. Examples are: rotary kiln, multi-stage incinerator, fluidized bed incinerator, boiling incinerator, multiple chamber incinerator, ship-borne incinerator, etc. Modern incinerators are installed with smoke and gas scrubbing equipment in order to prevent atmospheric pollution. Usually energy retrieving equipment is also installed to retrieve combustible gas and vapor for generating electricity. Some incinerators can even transform incinerated dregs into construction materials. Generally the dregs are land-filled.

3. Solidification Method

This is a method which, through chemical or physical measures, fixes or encloses wastes within a solid body end product, thereby decreasing or eliminating the leakage of harmful elements.

(1) Cement, silicate and lime welding method: mix cement, silicate, lime with wastes and form a solid concrete mixture. This is suitable for treating inorganic toxic wastes such as washing tower sludge, heavy metal sedimentation sludge and the like.

(2) Thermoplastic method: use thermoplastics such as tar, paraffins or polyethylene to mix with dry wastes and wrap them in during the cooling process. This method is appropriate for treating organic toxic substances, but not for treating organics, strong oxidants and the like.

(3) Organic polymer method: use one kind of monomer to mix completely with wastes and transform the mixture into polymer by adding a catalyst. This method is appropriate for treating toxic organics but cannot be used for treating acids and strong oxidants.

(4) Chemical methods: use the principles of acid-base neutralization, oxidation reduction, sedimentation, etc., to decrease or eliminate the harmfulness of wastes.

(5) Biological methods: use the biological degradation of various organics. There is the active sludge method, the soil cultivation method, the high temperature compost method, the aerobic and the anaerobic fermentation method, etc.

(6) Comprehensive method: for treating organic and inorganic mixture by combining several kinds of techniques. For example: combine effective eluviation with incineration; microbiological degradation with ozone oxidation or with alkali metal reduction; cement kiln high temperature roasting with microwave treatment, etc.

(7) Well injection method: Many countries make use of wasted pits for back-filling harmful wastes. This method does not only dispose of a lot of wastes and reduces investment but is also advantageous for the recovery of landforms. A study on waste dumps carried out by the United States Environmental Protection Agency found that the well injection method is used more than the land fill method. However, wells which are not handled carefully have resulted in serious underground water pollution. Therefore, when adopting this method, detailed hydrogeological information has to be mastered. Besides, the wastes to be filled should be treated to the degree permitted by the environment and the wells should be equipped with security measures and monitoring systems.

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REGIONALIZATION OF SEWAGE IRRIGATION REVIEWED

Dalian HUANJING KEXUE XUEBAO [ACTA SCIENTIAE CIRCUMSTANTIAE] in Chinese No 2, Jun 84 pp 111-116

[Article by Li Senzhao [2621 2773 3564] and Xia Zenglu [1115 1073 4389] of the Geography Institute, Chinese Academy of Sciences: "Regionalization of Sewage Irrigation in China"]

[Text] Abstract--Based on geographical viewpoints and methods, this article has proposed the principles and methods of regionalizing sewage irrigation. The authors hold that the regionalization of sewage irrigation is an environmental regionalization, and should therefore be carried out based on the law of ecological and environmental regional differences and the demands for sewage irrigation. The regionalization of sewage irrigation throughout the country consists of two levels: divisions and regions. The whole country is divided into four divisions; each division is divided into two regions.

Our country has a long history of utilizing sewage in agriculture. An important topic in environmental science is how to utilize the water and fertilizer resources in sewage and to simultaneously utilize land treatment systems as an effective approach to sewage treatment. Thus, the study of sewage irrigation is of unique theoretical and practical significance.

Sewage irrigation is carried out on the plains and low-lying and flat regions. Thus, high-level regionalization throughout the country is primarily based on the compatibility of flat land.

I. The Principles of Regionalizing Sewage Irrigation

The regionalization of sewage irrigation is an environmental regionalization, which is carried out based on the law of regional ecological and environmental differences and the demands for sewage irrigation. It provides the scientific basis for environmental protection planning and the prevention and treatment of environmental pollution. The principles of regionalizing sewage irrigation are also the bases for regionalizing sewage irrigation, which can be summarized in the following three points:

A. Compatibility with the Environmental Structure

All kinds of natural factors join together to form a complex natural integrated body called the natural environment. The basic characteristic of a natural environment embodies obvious laws of regional differences. Precisely because of this law of regional differences, the natural environment and the factors which it composes will display regional differences. These differences result in diversity in how mankind utilizes nature, transforms nature, carries out production and construction, and launches all kinds of social activities. Thus, the differences in the structure of the natural environment will affect the diversity in the structure of the social environment. The law of regional differences is the theoretical basis for environmental regionalization and the theoretical basis for the regionalization of sewage irrigation.

B. Compatibility with the Utilization of Sewage

This basic law of regional differences determines the relative compatibility of mankind's production activities of a similar region. It also determines the relative compatibility with the utilization of sewage. Different environmental factors of different sewage irrigation zones (primarily referring to different moisture, heat and vegetation) will mean differences in utilization by agriculture and the direction of agricultural development. Similar environmental factors of a sewage irrigation region determine the compatibility with the utilization of sewage. Presently, our country primarily uses sewage in irrigating farmland. A small amount is used in breeding fish. We hardly use sewage on forest grounds (including vineyards and orchards), pastoral areas and wasteland. In regionalizing sewage irrigation, we must take into consideration the factors and characteristics of agricultural (large-scale agricultural) production, study the direction for further developing the use of sewage in agriculture, and provide the scientific basis for guiding and planning sewage irrigation in line with local conditions.

C. Compatibility with Environmental Protection

The law of regional differences also determines the differences in source, quantity, and quality of sewage for irrigation in different irrigation regions. It also determines the differences in the effects of sewage irrigation on the environmental quality of the local region as well as other regions. Furthermore, it also determines the relative compatibility in the direction and measures for environmental protection within the same sewage irrigation region. For instance, the Southern Paddy Field Region has slightly acidic soil. The harm of cadmium pollution will be intensified after irrigation by sewage containing cadmium. The Northeast Cold and Wet Region suffers from low temperature in the winter. The rivers, lakes and reservoirs have a long frozen period. If sewage that contains a high volume of organic materials is drained into the surface water body, then these materials will consume the soluble oxygen in the water, thereby diminishing oxygen supply greatly or completely. This will be a fatal threat to the organisms underneath the ice, and will seriously harm the aquatic products industry.

II. The Methods of Regionalizing Sewage Irrigation

The regionalization of sewage irrigation for the whole country must provide a directional and strategic scientific basis for sewage irrigation and environmental protection. It not only must summarize the regional differences in the sewage irrigation throughout the country, but must also serve as reference for the sectors which are involved in overall planning. Thus, the regionalization of sewage irrigation for the whole country should be clear and concise, and should not be excessively detailed. Preliminarily, a two-level system of regionalization is planned.

In light of the major differences[1] in our country over all natural factors, the the differences[2] in the basic characteristics of agricultural production, and in light of the differences in the basic characteristics of utilizing sewage by agriculture which are determined by the above two factors, we have divided the whole country into the following four "divisions:"

A) The Northern Dry Farming Region; B) the Southern Paddy Field Region; C) the Northwest Dry Region; and D) the Qinghai-Xizang High and Cold Region. Each division is further divided into two regions based on the differences in the primary factors or the primary plus secondary factors that affect the growth of plants (such as crops). The "regions" of the second division in the regionalization of sewage irrigation have fully summarized the most fundamental regional differences in the sewage irrigation in our country.

The second division in the regionalization is as follows:

A. The Northern Dry Farming Region. According to temperature and moisture, the region is divided into two zones: A1) The Northeast Cold and Wet Zone (equal emphasis on water and fertilizer); and A2) the Central Plain Warm and Moist Zone (equal emphasis on water and fertilizer).

B. The Southern Paddy Field Region. According to temperature and moisture, this region is divided into two zones: B1) The Central China Moist and Hot Zone (with emphasis on fertilizer); and B2) the Central Plain Warm and Moist Zone (with emphasis on fertilizer).

C. The Northwest Dry Region. In light of the differences primarily in moisture, this region is divided into two zones according to the 2.0 contour line of dryness: C1) the Semi-Dry Zone Beyond the Great Wall (with emphasis on moisture); and C2) the Northwest Dry Zone (with emphasis on moisture).

D. The Qinghai-Xizang High and Cold Region. In light of the differences[3] in temperature and types of agricultural production, this region is divided into two zones: D1) the Sichuan-Xizang High Mountainous and River Valley Zone; and D2) the Qiangtang Plateau Zone.

Apart from the regionalization of sewage irrigation through the country, there are also intermediate regionalization of sewage irrigation and low-level regionalization of sewage irrigation, which will not be dealt with at this point in this article.

III. Regionalization of Sewage Irrigation

As mentioned above, the regionalization of sewage irrigation throughout the country is a high-level regionalization of sewage irrigation that is divided into two levels: The first level is referred to as "divisions," and the whole country is divided into four divisions. The second level is referred to as "regions," and the whole country is divided into eight regions.

A. The Four Large Sewage Irrigation Divisions

1) The Northern Dry Farming Region

The Qin Ling-Huai He line is the most important north-south dividing line of the monsoon region in the eastern part of our country. It is the boundary for the basic equilibrium (with the degree of dryness being 1.0) between precipitation and evaporation. In addition, it is the most important north-south dividing line[4] in the agricultural geography of the eastern part of our country. This line separates the Northern Dry Farming Region from the Southern Paddy Field Region.

The Daxing'an Ling-Yan Shan-Great Wall line is the dividing line between the Northern Dry Farming Region and the Northwest Dry Region. East of this line, agriculture and forestry are the main activities. West and north of this line, agriculture and livestock breeding are the main activities.

In the sewage irigation of this region, we should attach importance not only to the utilization of moisture but also the utilization of fertilizer. This is a region where moisture and fertilizer are of equal importance. The acreage of farmland in this region constitutes almost half of that of the entire country. The gross grain output constitutes over one-third of that of the whole country. The gross output of wheat, corn, cotton and beet constitutes over half of that of the whole country. This is one of the most important agricultural regions in our country. The majority of this region is a semi-wet region, with an annual precipitation between 400 and 800 mm, unevenly distributed throughout the year. Over 70 percent of the rain falls in the three summer months, mostly in the form of rainstorms. In addition, the great changes in the rainfall from year to year further intensify the water shortage. The industry of this region constitutes a high percentage of that in the country. There are many large and medium-sized cities with a high population density. Thus, the volume of sewage drainage is large. The sewage irrigation of this region constitutes over 90 percent of the sewage irrigation throughout the country, and is the region with the highest concentration of sewage irrigation in the whole country. The nationally-known sewage irrigation zones, including Beijing, Tianjin, Shenyang, Jinan, Xian, Shijiazhuang, Zhengzhou, Qiqihar, Luoynag, Baoding and Harbin, all converge here. Thus, we can well perceive that this region is the most important sewage irrigation region in our country.

2) The Southern Paddy Field Region

South of the Qin Ling-Huai He and east of the Qinghai-Xizang Plateau, the vast region that includes the northern tropical mountainous districts of the southeastern part of Xizang is the second most important sewage irrigation region in our country--the Southern Paddy Field Region. The farmland in this region constitutes more than one-third of that of the whole country. The gross grain output constitutes more than one half of that of the whole country. The output of rice constitutes over 90 percent of that of the whole country. This also is the most important region for growing sugarcane, rape, and peanut as well as sub-tropical and tropical industrial crops and fruits. This is also one of the most important agricultural regions in the whole country. The industry of this region also constitutes a high percentage of that in the whole country. There are also many large and medium-sized cities and also high population density. Thus, the volume of sewage drainage is also large. The acreage of sewage irrigation of this region constitutes roughly 6 percent of that of the whole country. The south is a wet region, with an annual precipitation of over 1,000 mm. Water shortage is not a prominent problem. In utilizing sewage for irrigation, the primary concern is to obtain the fertilizer resources from the sewage.

3) The Northwest Dry Region

West and north of the Daxing'an Ling-Yan Shan-Great Wall line, the broad semi-dry and dry region north of the Qinghai-Xizang Plateau (including the Qaidam Basin) is known as the Northwest Dry Region.

The annual precipitation of this region is under 250 mm, with the dryness at over 1.2 degrees. It is a region of pastures, semi-deserts and deserts, with livestock breeding as the primary activity, and a rather small percentage of agriculture. Without irrigation, the majority of the region does not have agriculture. Thus, water shortage is the primary contradiction in this region. The volume of sewage drainage in this region is extremely low. There is a very small percentage of farming. Thus, sewage irrigation is not developed, but is only scattered throughout the region.

4) The Qinghai-Xizang High and Cold Region

The Qinghai-Xizang Plateau is the highest plateau in the world, with an acreage of 4,000 m above sea level. It is a unique high and cold region. There is a small amount of farming in the river valleys in the southern and eastern parts of this region. The acreage of farmland constitutes only roughly 0.5 percent of that of the whole country. There is very little industry in this region. Population is sparse. The volume of sewage drainage is minimal. A small volume of sewage can be utilized in line with local conditions. However, in terms of sewage irrigation throughout the country, it is negligible.

B. The Eight Sewage Irrigation Regions

1) The Northeast Cold and Wet Region (with emphasis on both water and fertilizer)

This region enjoys a temperate and cool temperate climate. The frost-free period is 80 to 90 days in the north and 110 to 150 days in the south. Due to the fact that the growth cycle of crops is short and that half a year is "dead winter," temporal restriction has been put on the use of sewage in farmland irrigation. The earth may be frozen 7 months out of a year. In the north, there is even permanently-frozen earth. The frozen period for rivers is long, generally over 5 months. After the rivers become frozen, the river water cannot recover its oxygen naturally. The capacity of oxygen-consuming pollutants in the water under ice is extremely small. This has seriously limited the drainage of sewage into the water body under the land surface. In particular, after the organic pollutants have drained into the water body of the rivers and lakes, they will use up all the soluble oxygen in the water under the ice layer, which will cause the fish in the water to suffocate and die.

The brown earth and cold podzol (with the exception of black earth and chernozem) of this zone are acid soil, which may be polluted by heavy metal after sewage irrigation. The content of heavy metal in acid soil is generally low. Therefore, harm will be brought about easily by pollution.

In light of the environmental characteristics of this region, while treating the sewage of the factories, agriculture and forestry should try each and every means to utilize sewage, so as to prevent pollution of surface waters. Presently, the acreage of sewage irrigation in this region ranks second in the country.

2) The Central Plain Warm and Moist Region (with equal emphasis on water and fertilizer)

This is quite similar to a temperate moist and semi-moist region. The moist zone constitutes a small area, which is confined to the Shandong Peninsula and the Liaodong Peninsula. The majority of the region is a semi-moist zone.

This region includes all of Beijing Municipality, Tianjin Municipality and Shandong Province, most of Hebei, Henan, Shaanxi, Liaoning and Shanxi Provinces, and part of Gansu, Qinghai, Jiangsu and Anhui Provinces. Concentrated in this zone are the famous agricultural zones of the Huang Hai and Huai Hai Plains, the plain at the lower reach of the Liao He, and the Fen He-Wei He river valley. Here, the acreage of farmland constitutes roughly one-third of the farmland throughout the valley. There is a long history of farming. Agriculture is developed. However, there is inadequate water resources. The degree of runoff of the Huang Hai-Huai Hai Plain is only 50 to 150 mm. The runoff in the central and northern plains of the river valley is less than 50 mm, which is only one-fourth to one-ninth of that of the plain at the middle and lower reaches of the Chang Jiang. The farmland of this region and the Northeast Cold and Moist Zone constitutes

50 percent of that of the whole country. The volume of runoff, however, only constitutes roughly 10 percent of the gross volume of the whole country. Thus, this zone appears to be rather dry, and does not have an adequate supply of water for irrigation to meet the demands for it. The industry in this zone constitutes a rather high percentage of that of the whole country. Also, there are many large and medium-sized cities. Thus, the volume of sewage drainage is very large. The present acreage of sewage irrigation constitutes roughly 87 percent of the toal acreage of sewage irrigation throughout the country, and ranks first in the country.

The volume of sewage drainage of this zone is large. Most of it has drained into ditches, channels and rivers without treatment, thus polluting the surface water and a portion of the groundwater, and worsening the urban and suburban environment. The season for irrigation in this region is short. Sewage is utilized for less than half a year. Consequently, the environment, particularly the river water, will inevitably be polluted. The acreage of sewage irrigation in this region is large. However, this is mostly irrigation by flooding without scientific management. Thus, the crops, soil and groundwater of certain sections of the region are polluted. All these require attention and improvement.

3) The Central China Moist and Hot Region (with emphasis on fertilizer)

This region is situated south of the Qin Ling-Huai He and north of the Nan Ling, and includes the mountainous districts on the northern tropical border in the southeastern part of Xizang. The gross grain output of this region constitutes roughly half of that of the whole country. This is one of the most important agricultural regions in our country. Presently, the acreage of sewage irrigation ranks third in the country.

The regional earth of this zone is red earth and loess. There are also yellowish-brown earth and yellowish-drab earth, which are all acid soil. Loess, particularly, is most acidic. The acid soil has a low environmental capacity for most of the heavy metallic pollutants. In particular, such heavy metals as cadmium and mercury are highly soluble in acid soil, thus activating the soil to a great extent. The extent of harm to crops and people's health far surpasses that of the north. We must raise our vigilance in this regard. This region has abundant rainfall and heat. The reduction-oxidation of organic pollutants and the decomposition of living things are intense and fast. The river water does not freeze. The environmental capacity of the water body is large and the self-cleansing ability is strong.

4) The South China Humid and Hot Region (with emphasis on fertilizer)

This region roughly encompasses the tropical and southern sub-tropical regions south of the Nan Ling. This is the only region for producing tropical industrial crops in our country. The farmland in this region constitutes only 5.8 percent of that of the whole country. The present acreage of sewage irrigation constitutes roughly 2 percent of that of the whole country.

This region enjoys high temperature and frequent rainfall, and is a region with the richest water resources and heat resources in the country. The pollutants inside this region undergo rapid migration and transformation. The water environment has a strong self-purification ability. The environmental capacity is large. Lateritie, laterite-transformed red earth and loess are all acid soil. After sewage irrigation, such heavy metallic pollutants as cadmium and mercury will easily harm the soil. We must attach importance to this problem.

5) The Semi-Dry Region Beyond the Great Wall (with emphasis on water)

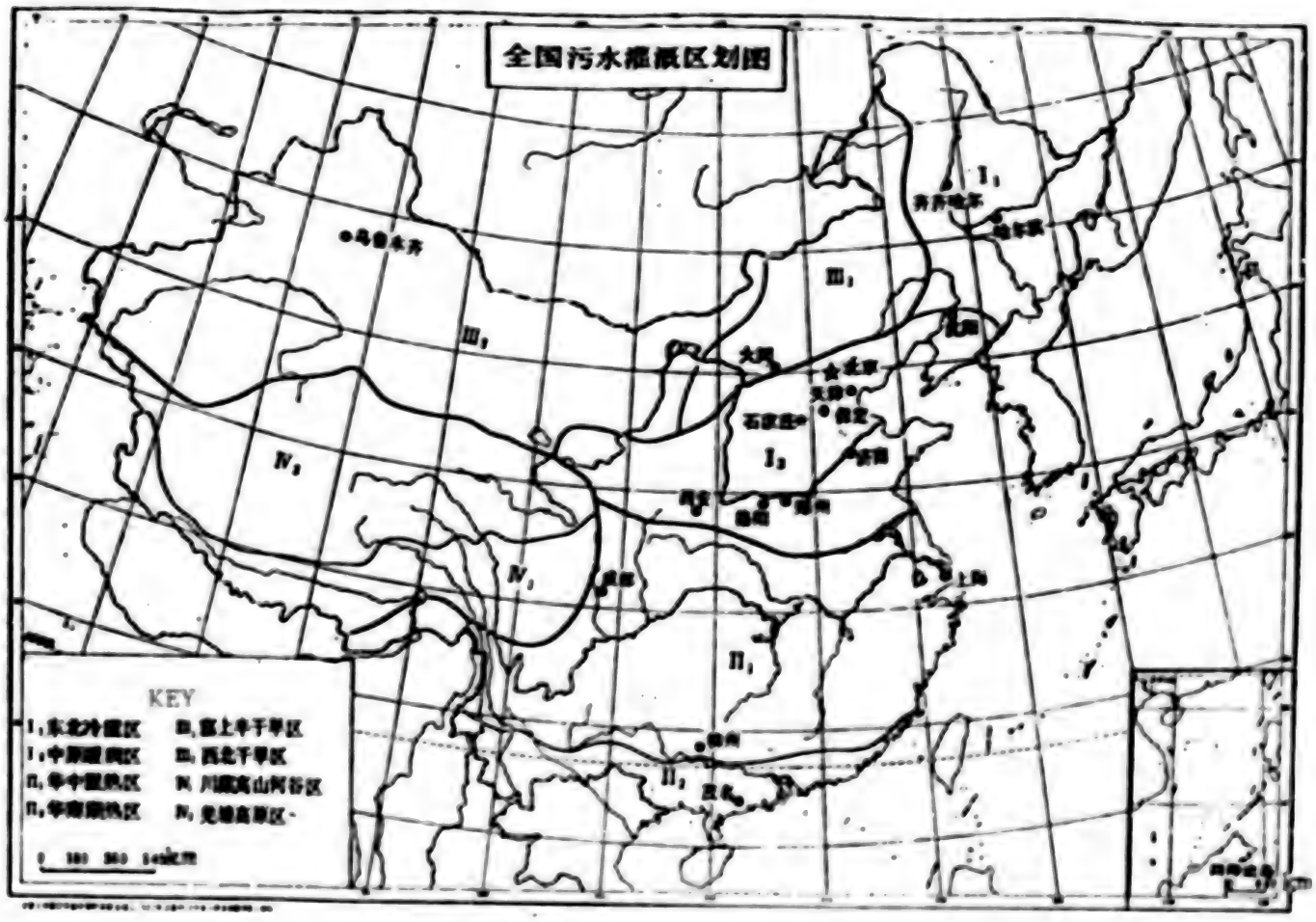
This is a dry pastoral region. Its western border is also the western boundary for possible dry farming. The precipitation in this zone ranges from 250 to 400 mm, with dryness at 1.2 to 2.0 degrees. Evaporation is high. There may be harvest without irrigation. However, there will be no guarantee for output. Basically, it relies on heaven for food and fears drought. Because there is very little dilution by clear water in this zone, we must be discreet in irrigating farmland with sewage. At the same time, we must prevent secondary salinization.

6) The Northwest Dry Region (with emphasis on water)

The Northwest Dry Region north of the Qinghai-Xizang Plateau is one in the country that is most lacking in water resources. Here, we have a desert climate with an annual precipitation of under 250 mm. The western part of the Qaidam Basin is under 20 mm. The Kumudage Desert south of Luobubo is only slightly above 10 mm. Without irrigation, there will be no agriculture in this region. Thus, it is referred to as oasis agriculture. The acreage of farmland in this region constitutes only roughly 4.4 percent of that of the whole country. There is relatively little industry. The land is vast and the population is sparse. The volume of sewage drainage is small. Presently, the acreage of sewage irrigation only constitutes 1 percent of that of the whole country. Nevertheless, in this most dry and water-lacking region in the country, it is of great significance to effectively utilize sewage as a supplementary measure to clear-water irrigation in order to develop agricultural production. However, due to dryness, lack of water and extremely high evaporation in this region, we must strictly control the water quality in sewage irrigation so as to prevent harm done to crops. In addition, we must strictly prevent secondary salinization in the soil.

7) The Sichuan-Xizang High Mountainous and River Valley Region

South and east of the Qinghai-Xizang Plateau is the high mountainous and river valley region. Here is a plateau temperate region, with livestock breeding as the main occupation. The river valleys inside the region form an important agricultural region. There are a few medium-sized and small cities and a small volume of industry. The volume of sewage is extremely low. Presently, there is no information on sewage irrigation. The acreage of farmland in this region constitutes only roughly 0.5 percent of that of the whole country. In the future, even if we can develop some irrigation of farmland by sewage, it will still be negligible on a national scale.



全 国 污 水 灌 溉 区 划 图

Map of sewage irrigation regionalization in China

I_1 The Northeast Cold and Wet Region

I_2 The Central Plain Warm and Moist Region

II_1 The Central China Moist and Hot Region

II_2 The South China Humid and Hot Region

III_1 The Semi-Arid Region Bevond the Great Wall

III_2 The Northwest Arid Region

IV_1 The Sichuan-Xizang Mountain and River Valley Region

IV_2 The Qianetang Plateau Region

A. Qiqihar
B. Ha'erbin
C. Shenyang
D. Datong
E. Beijing
F. Tianjin
G. Shijiazhuang
H. Baoding
I. Jinan
J. Xi'an
K. Luoyang
L. Zhengzhou
M. Shanghai
N. Chengdu
O. Liuzhou
P. Maoming
Q. Urumqi
R. Nanhai Islands

8) The Qiangtang Plateau Region

This region is a high and cold desert, roughly 5,000 m above sea level. The plateau enjoys integrity in topography and a severely cold and dry climate. Precipitation is primarily in solid form. The northern part of this region is a cold desert and is uninhabited. The southern part is purely a high and cold pastoral area, with yak breeding as the main occupation. There is no farming and no sewage irrigation.

(Acknowledgement to Mr Chen Chuankang [7115 0278 1660] for his valuable ideas for this article.)

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(Article received on 4 July 1983)

9335
CSO: 4008/363

CONTENTS OF HEAVY METALS AT MOUTH OF JIULONG JIANG STUDIED

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 3, 30 Jun 84 pp 31-35

[Article by Zhang Shisan [1728 1102 0005], Huang Yankuan [7806 5888 1401] and Zeng Xianshi [2582 4258/5029 4258] of Third Oceanography Institute, State Oceanography Bureau: "Content Distribution of Different Size Heavy Metal Elements in Sediments at the mouth of the Jiulong Jiang"]

[Summary] The distribution of the content of different size of Cu, Pb, Cr, Mn, Ti and V in the surface sediments of the Jiulong Jiang estuary was studied first by grouping by size and then by determining elemental content. Mineral particles and biological remains were separated for a preliminary understanding of the biological function and effect of mineral particles on the above-mentioned elements in the sediments described.

It is concluded that the geochemical properties of elements, sediment types and constituents in various sizes are major factors influencing the content distribution of elements. As the enrichment body and migration carriers of Cu, Pb and Mn, the plant remains in sediments impact strongly and enrichment and content distribution of Cu, Pb and Mn in sediments. Based on the content distribution of the above-mentioned elements in sediments, contents of elements in suspension, and the distribution properties of sediment size, natural sources of heavy metals predominate in the sediments of the estuary; there is no visible effect by man-made pollution.

One figure shows the locations of the sampling stations. Three tables show the content of heavy metals in sediment, mean content of elements in suspension, as well as contents and content distribution of elements by size. The authors express their gratitude to Xu Kuncan [6079 2492 3505], Zhang Weilin [1728 4850 2651] and Shen Ruohui [3088 5387 1979] for assisting the study.

10424
CSO: 4009/14

BRIEFS

WILDLIFE PROTECTION MEETING ENDS--The first annual meeting of the wildlife protection committee of five provinces and regions in northwestern China concluded today in Urumqi. Various provinces and regions in northwestern China were urged to further do well in the work of protecting wild animals and to make new efforts in achieving a fundamental turn for the better in maintaining the natural ecological balance in the area. It was decided at the meeting to compile and publish books on such scientific topics as birds and mankind, as well as a handbook on protecting wild animals. In addition, it was decided to make full use of the live teaching materials and scientific research force, and to run 2-year courses for advanced studies in protecting wild animals, so as to provide the necessary staff for various wildlife protection areas. Yusufu Muhanmode [Mohammed], chairman of the wildlife protection committee of five provinces and regions in northwestern China and vice chairman of the region, presided over the meeting and delivered a summary speech. [Text] [Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 30 Oct 84 HK]

CSO: 4008/105

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TITLE: "The Rule Simplifying the Coates Figure and Its Application"

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 5, May 84 pp 403-415

TEXT OF ENGLISH ABSTRACT: A rule simplifying the Coates figure is established. Using this rule, the complicated structural figure of large molecules can be changed into a simpler one, thus making easy the calculation of the energy levels and coefficients of Hückel molecular orbits. The rule is suitable for various kinds of complex molecules. As one of the applications of the rule, the author solves the problem of simplification of the structural figure of molecules, obtained by bonding in series $n+2$ units, with each different from the other in chemical structure. For the calculation of orbits of these molecules, the concept of transfer matrix is established. Thus we can change the calculation of these molecules into a multiplication of transfer matrix of units. Using this method in the calculation of orbits of a poly-unit molecule with complicated bond units, the formula for the characteristic equation of this molecule is thus obtained.

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TITLE: "The Extraction of Noble Metals by N_{1923}. I. The Extraction of Platinum, Palladium and Rhodium in HCl Medium"

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 5, May 84 pp 487-491

TEXT OF ENGLISH ABSTRACT: The extraction of platinum, palladium and rhodium by N_{1923} (a mixture of primary amines containing C-chains with 19-23 atoms) is investigated. The extraction is nearly quantitative at low acidity. The order of extractability by N_{1923} in seven diluents is: *n*-hexane ≈ cyclohexane > 1,2-dichlorethane > xylene ≈ carbon tetrachloride > benzene > chloroform. The extraction is influenced by acidity of the aqueous phase and it is rapidly reduced when the acidity is increased. The effects of concentration of NaCl and HCl on extractions are almost the same. It is suggested that the decrease of extraction efficiency can be explained by competitive extraction of chloride ion and the complex anion of rhodium and palladium. Aquation has a remarkable effect on the extraction of rhodium, but it can be prevented by evaporating the solution with HCl nearly to dryness, and the extraction is enhanced remarkably after treatment. The extracted compound of rhodium is $(RNH_3)_2Rh_2Cl_9$, in which rhodium is dimeric. The back extractable percentages of platinum and palladium are only about 50 percent, so it is suggested that the inner complex extraction system be coexistent with the ion pair extraction system. The extraction of these two elements is in the form of $(RNH_3)_2PtCl_6$ and $(RNH_3)_2 \cdot PdCl_4$ for ion pair extraction system and $[(RNH_2)_2PtCl_4]$ and $[(RNH_2)_2PdCl_2]$ for the inner complex extraction system respectively.

9717
CSO: 4009/53

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TITLE: "An Investigation of Chemiluminescence Reaction in Luminol-$AuCl_4^-$-H_2O_2 System--Determination of Trace Quantities of Gold in Ores"

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 6, Jun 84 pp 562-566

TEXT OF ENGLISH ABSTRACT: Luminol-$AuCl_4^-$-H_2O_2 chemiluminescence system is studied and reported. The liquid chemiluminescence method of determination of gold has been worked out. The detection limit of the method is 4×10^{-11} g/mL Au. The linear range of the calibration curves is $1 \times 10^{-10} \sim 1 \times 10^{-5}$ g/mL Au. The relative standard deviation is ±3 percent for determination of 6×10^{-10} g/mL Au. This method can be used for the determination of trace quantities of gold in ores.

9717
CSO: 4009/54

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TITLE: "Kinetics of the Formation of N_2O in Catalytic Oxidation of NH_3 on Pt-Rh Filament"

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 8, Aug 84 pp 753-758

TEXT OF ENGLISH ABSTRACT: The kinetics of the reactions involving the formation of N_2O in the catalytic oxidation of NH_3 have been studied over a polycrystalline Pt-10 percent Rh filament in a static system, using a Fourier transform infrared spectrometer to monitor the partial pressures of NH_3 and N_2O. The formation of N_2O proceeds only over the filament temperature range of 250-350°C. The reaction rate is of the first order in NH_3 pressure and half order in O_2 pressure, and the rate equation can be written as $v = k_{app} P_{NH_3} \cdot P_{O_2}^{1/2}$. The apparent activation energy of the N_2O formation reaction from the temperature coefficient of the rate constants is found to be 25 kcal/mol. The interpretation of these results in terms of the Eley-Rideal type mechanism is presented. The rate-controlling step might be the reaction between gaseous ammonia molecules and the chemisorped oxygen atoms on the surface.

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TITLE: "Studies on the Single-pulse CO_2 Laser Initiated Explosion of NH_3-CH_4-O_2 System"

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 8, Aug 84 pp 775-778

TEXT OF ENGLISH ABSTRACT: A single-pulse from a TEA CO_2 laser is used to initiate 1:1:1.5 and 1:1:3 mixtures of NH_3-CH_4-O_2 at pressure from 75 to 250 Torr. The laser fluence required for initiation of the mixtures (i.e., ignition threshold) is found to depend on the composition of the mixture, the total pressure and laser frequency. Studies have also been carried out with the presence of Pt-10 percent Rh gauze for the single-pulse laser initiation explosion of the same gas mixtures. An interesting result is that the ignition threshold is lower than that in the absence of the Pt-10 percent Rh gauze. For both homogeneous and heterogeneous reactions, the main reaction products are the same, i.e., N_2, H_2O and CO_2 (some CO for deficient O_2 system). An intensive yellowish luminescence is observed immediately after the explosion. The explosion mechanism for the NH_3-CH_4-O_2 reaction is discussed.

9717
CSO: 4009/56

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TITLE: "Preparation of PVC Membrane Gold (III) Ion-Selective Electrode Based on Cetylpyridinium Aurichloride and Its Application to the Determination of Trace Gold in Ores:

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 479-483

TEXT OF ENGLISH ABSTRACT: A new PVC gold (III) ion-selective electrode has been reported. The sensor membrane is composed of cetylpyridinium aurichloride (0.008 g), dioctylphthalate (0.280 g) and PVC (0.150 g). It exhibits Nernstian responses to $AuCl_4^-$ ions with a slope of 58±1 mV/pM (20°C) over the range of 1×10^{-6} - 1×10^{-2} M. The limit of detection is 3.6×10^{-7} M. The electrode keeps going for more than seven months. The electrode shows high selectivity and stability. Satisfactory results were obtained in the determination of gold in ores over the range of from 0.16 to 4.75 g/t.

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TITLE: "The Basic Equation for Quantitative Analysis of the Phase in Steels by Potential Sweep Etching Current Method"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 495-500

TEXT OF ENGLISH ABSTRACT: Etching current under sweep potential has been studied based on a new mode of electrode reaction. The results indicate that when etching depth is much smaller than the particle size of the active phase in steel, and the etching process is controlled by diffusion, the peak current is proportional to the content of the active phase and independent of the particle size of the phase. Then a basic equation is derived for quantitative analysis of the phase in steel by the potential sweep etching current method carried out in a basic solution containing a complexing agent. This basic equation has been confirmed experimentally by etching quantitative analysis of σ phase in NaOH solution with tartaric acid as the complexing agent.

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TITLE: "Mechanism of Alcohol for the Micelle Systems of Rare Earths (or Thorium) and the Asymmetrical Bisazo Phosphone-Derivatives of Chromatropic Acid"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 501-504

TEXT OF ENGLISH ABSTRACT: The effect of the acidity, the concentration of surfactant and the amount of alcohol on the spectra of the RE (or Th)-amino-C acid chlorophosphonazo-cetyl pyridine bromide complexes is studied. The results reveal that alcohol does not act as a component of the complexes. In moderate amounts the alcohol makes the complex forming group ($-PO_3H_2$) free from the bind of the surfactant and impels the formation of ternary complexes; in excessive amounts it removes the action of the surfactant on the reagent and turns the ternary complexes into binary ones.

AUTHOR: XU Huiqing [6079 1979 0615]
QIN Jianhou [4440 1696 0186]

ORG: Both of the Department of Chemistry and Chemical Engineering, Qinghua University

TITLE: "Fourth-order Derivative Spectrophotometric Determination of Trace Amounts of Palladium with 2-(2'-Thiazolylazo)-5-diethylaminophenol (TAE)"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 504-508

TEXT OF ENGLISH ABSTRACT: A blue stable complex of palladium (II) with TAE forms at room temperature. The complex dissolves in 40 percent alcohol solution and the molar ratio of Pd to TAE is 1:1. The absorption spectrum shows two absorbent peaks: λ_{max} = 600 nm and $\lambda_{shoulder}$ = 664 nm. Its molar absorptivity ε_{600} is 2.78 x 10^4 at pH 2.2. The system obeys Beer's law in the concentration range of 0.06-0.9 ppm, when the concentration of TAE is 1 x 10^{-5} M. The method is not interfered with by the simultaneous presence of Fe (III), Co (II)(W/W_{Pd}=1000), Ni(II) (W/W_{Pd}=2000) and Cu (II) (W/W_{Pd}=40).

AUTHOR: QU Rongjian [3255 2837 4702]
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ORG: Both of the Laboratory of the Geological Bureau of Anhui Province

TITLE: "Use of Dual-Wavelength Spectrophotometry and Derivative Spectrophotometry in Ore Analysis. I. Simultaneous Determination of Palladium and Platinum"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 516-518

TEXT OF ENGLISH ABSTRACT: A direct method is described for the determination of palladium in the presence of large amounts of platinum by dual-wavelength spectrophotometry and determination of platinum in the presence of large amounts of palladium by fourth-order derivative spectrophotometry using N,N'-didodecyldithio-oxamide (DDO) as the color-forming reagent. The difference in absorbance of the DDO-Pd complex is proportional to the concentration of palladium at 444.0 nm and 539.9 nm, and that of the DDO-Pt complex is equal to zero. The $\frac{d^4A}{d\lambda^4}$ value of the DDO-Pt complex is proportional to the platinum concentration, while that of the DDO-Pd complex is equal to zero at 526 nm.

AUTHOR: WU Tingzhao [0704 1694 3564]
YAO Jianming [1202 1696 2494]
LIU Jilin [0491 4764 3829]

ORG: All of the General Research Institute of Non-ferrous, Ministry of Metallurgical Industry

TITLE: "A New Miniature Hydride Generator for Use in Hydride Generation-Flame Atomic Absorption Analysis. II. Determination of Amounts of Arsenic in Well Water and Antimony and Bismuth in H_{62} Brass"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 522-524

TEXT OF ENGLISH ABSTRACT: Interferences from sulfuric acid, nitric acid, perchloric acid and phosphoric acid and several common metal ions on determining arsenic, antimony and bismuth in hydride generation-flame atomic absorption analysis with the new miniature hydride generator are studied. The results of determinations of the amounts of arsenic in well water agree with those of the molybdenum blue method. Thiourea may be used effectively as the masking agent to eliminate the interference of copper matrix in the determination of antimony and bismuth.

AUTHOR: ZHANG Zhensen [1728 2182 2773]
GAN Shucai [3927 2885 2088]
YING Ping [2019 1627]

ORG: All of Changchun Geological Institute

TITLE: "Solvent Extraction-Graphite Furnace Atomic Absorption Determination of Trace Gold in Geological Samples"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 528-530

TEXT OF ENGLISH ABSTRACT: Gold in a geological sample is dissolved by using a solution of reverse aqua regia, extracted with 2-mercapto benzothiazole-butyl acetate, and determined by using an atomic absorption spectrophotometer with a graphite furnace atomizer. The sensitivity of 2.2×10^{-11} g, standard deviation of 27.83±0.685, coefficient of variation of 2.46 percent, and recovery ratio of 96.5-105 percent are obtained. Except for Sb and Pd, other existing elements do not interfere with the determination of gold. This method is sensitive, simple and rapid for the determination of trace gold in geological samples.

9717
CSO: 4009/58

AUTHOR: HUANG Songxian [7806 1345 3759]

ORG: Department of Chemistry, Central-South Institute of Mining and Metallurgy

TITLE: "Catalytic Polarographic Determination of Microamount Cobalt"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 7, 20 Jul 84 pp 583-586

TEXT OF ENGLISH ABSTRACT: The catalytic polarographic wave of Co(II) in the system of 1,10-phenathroline-NO_2^--NH_4Cl has been studied. Under optimal conditions Co(II) can be detected as low as 1×10^{-9}M by dc polarography, and a linear relationship holds between the wave heights and concentrations of 3×10^{-9} - 1×10^{-7}M for Co(II). The method is rapid, simple, sensitive and accurate. It has been used to determine micro amounts of Co in tungsten trioxide and molybdenum trioxide.

AUTHOR: YANG Zhibin [2799 1807 2430]

ORG: Department of Chemistry, Jiangxi University

TITLE: "Catalytic Spectrophotometric Determination of Trace Rare Earth"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 7, 20 Jul 84 pp 592-596

TEXT OF ENGLISH ABSTRACT: A new and sensitive spectrophotometric method has been developed for the determination of trace amounts of rare earths. Under certain conditions, a ternary complex is formed by rare earths with Mo(VI) (Na_2MoO_4) and chlorophosphonazo III (CPA III), and the molar ratio is estimated to be 1:1:1 for RE:Mo:CPA III. If the sample solution is warmed in a thermostat at 80°±0.5°C, with pH ranging from 6.0 to 6.2, the complex can be easily reduced by sodium sulfite, and the color of the solution is changed from blue to violet. Its absorbance is decreased remarkably at 600 nm, and the drop value of ΔA is proportional to the concentration of rare earths in a definite amount.

AUTHOR: DU Xiangyun [2629 4382 0061]
SONG Xiaomin [1345 1420 2404]

ORG: DU of South-Central Research Institute of Metallurgical Geology; SONG of the Department of Chemistry, Wuhan University

TITLE: "Catalytic Polarographic Determination of Trace Vanadium"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 7, 20 Jul 84 pp 606-608

TEXT OF ENGLISH ABSTRACT: In a buffer solution of HAc-NaAc at pH $\approx$ 5.2, the complex of vanadium with cinchonine and cupferron produces a well-defined sensitive catalytic wave with peak potential at -0.83V (vs SCE). The peak current is increased 30 times by the addition of cinchonine, and is linearly proportional to the concentration of vanadium over the range of 0.0001 - 0.05 μg/ml with detection limit of 0.0001 μg/ml. Most of the metal ions do not interfere with the determination of vanadium under certain conditions. The interference of Fe^{3+} and Al^{3+} may be eliminated with ammonium fluoride as the masking agent. This method is applicable to the rapid determination of trace amounts of vanadium in ores.

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CSO: 4009/59

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TITLE: "Development of Three-dimensional Seismic Instrument Using P-80 Coded Clock for Deep Explosion Seismic Sounding"

SOURCE: Changchun CHANGCHUN DIZHI XUEYUAN XUEBAO [JOURNAL OF CHANGCHUN COLLEGE OF GEOLOGY] in Chinese No 1, 1984 pp 101-106

TEXT OF ENGLISH ABSTRACT: According to the comparison and analysis of seismic instruments for deep explosion seismic sounding at home and abroad, the Changchun College of Geology has developed the seismic instrument system in collaboration with the Chongqing Geological Instrument Plant.

This paper relates the selected project, including problems solved in the development of the instrument and its characteristics.

The characteristics of this instrument are as follows:
1. Using FM center frequency and deviation in accordance with the same kinds of instruments produced in Western Europe;
2. Using CDJ-6 type three-dimensional seismeter first invented in China;
3. The noise of the system and the geophone amplifiers less than 1 vpp;
4. Using Sony CFS-65s Cassette Recorders rather than special tape recorders;
5. Two types of coded clocks are developed for users. One is the coded clock composed of MSI of CMOS made in China, and the other is P-80 coded clock consisting of the LSI, such as Z-80 CPU, EPROM and CMOSRAM.
6. Schmidt circuit with large hysteresis and pulse-average discriminator with one-monostable output are used in the demodulator. S/N ratio is increased from 16db to 20db with pilot frequency of wow and flutter compensation.
7. The whole system is comprised of a field receiving station and play-back station. The field receiving station is comprised of a three-dimensional seismeter box, a modulator box and a cassette recorder box. The playback station is comprised of a cassette recorder box, demodulator box and a visual-recorder box.

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CSO: 4009/41

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